

FLIGHT

First Aero Weekly in the World.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

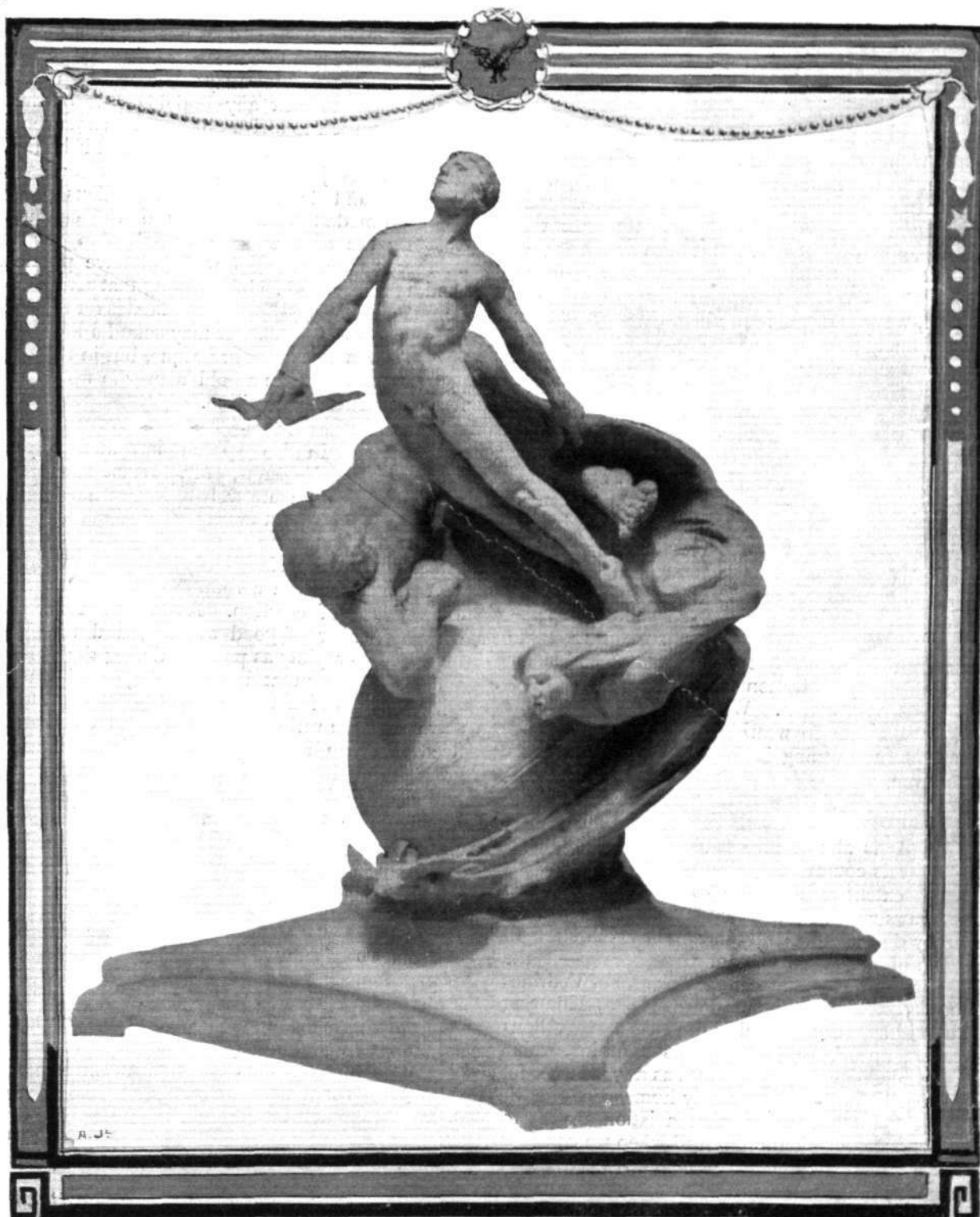
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The Collier Aviation Trophy, presented by the Aero Club of America to Glenn H. Curtiss for the greatest advance in aviation in the United States during the year 1911.

EDITORIAL COMMENT.

**Before
it is
Too Late!**

From different quarters complaints reach us of the potentially dangerous flying that is becoming quite a feature at the great aerodromes. The practices we have in mind are mainly indulged in by a few of the most experienced, though most thoughtless, of the aviators using these grounds. In particular, the habit of flying above the heads of spectators appears to be on the increase and it certainly is one which is strongly to be deprecated. The fact that so far it has not been accountable for accident does not make it as a practice any the less an offence against good judgment, for nothing in the world could militate more against the immediate progress of the movement than a catastrophe which could be laid at the door of thoughtless and recklessness or the desire for doing "stunts."

For the most part, spectators at the aerodromes seem to live in a state of blissful unconsciousness of the danger they incur from this practice of flying across the enclosures, and it is one of those cases in which, while ignorance is certainly bliss, it is far removed from wisdom. For there is always a danger, despite the fact that nothing had happened hitherto. But even supposing we admit that we may possibly be exaggerating a little for the sake of impressing the lesson on those to whom it should appeal, we would put it to them that the practice is not an absolutely safe one and that, we submit, should be enough for the right-thinking pilot who wishes well to the movement with which he is identified.

If a pilot chooses to give circus performances over an open ground for the entertainment of the gallery, and incidentally, for his own glorification, that is to a very great extent his own business. His neck is his own and, within limits, he is at liberty to risk it, but he is most certainly not justified in exposing to the very slightest unnecessary danger those who form his audience. We are not alarmists; flying is safe enough, but like all sports or pursuits calling for the exercise of nice judgment there is an element of risk in it which should impel—especially at this stage—those who practise it to make doubly certain that no one but themselves should suffer from that momentary aberration which comes to the best-balanced minds on occasion. We trust that those whom the cap fits will assent to wearing it with a good grace and will accept our warning in the same kindly spirit in which it is given.

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**Aerial
Electioneering.**

It is almost impossible for the public in this country to realise to how enormous an extent aviation has caught on in France. There are straws which show which way the wind blows, but even they do not sufficiently indicate the full strength and direction of the gale. One of these straws—if the parallel is allowable—is the recent experience of Vedrines in his candidature for the French Parliament. Knowing the man himself, we can only describe it as marvellous that he came so nearly to achieving his ambition, which was to sit in the Chamber of Deputies as a "member for the air." That he did come so nearly home can only be ascribed to the intense appeal that aviation makes to the French popular imagination. And when we consider that he was fighting an official candidate, backed by all the influence of political organisations and that even Cabinet Ministers were invoked to take the field against

him, the marvel is an even greater one. Leaving now the purely personal element, Vedrines' campaign is yet another outstanding object-lesson in the progress that aviation has made within a comparatively recent period—almost, we had said, within recent months. Here is a man who has to canvass a widely scattered constituency and to address the electors at remotely situated points, far apart from each other. He ignores altogether the more conventional methods of locomotion, and, under all sorts and conditions of wind and weather, betakes himself to his monoplane and literally descends upon the electors from the skies. And the wonder of it all is that it simply appeals to us as being quite commonplace and a matter of course. It does not excite our imaginations at all, because it is just the sort of thing that we expect of the aeroplane nowadays. The idea that Vedrines should essay to visit any outlying part of the Limoux division and fail to arrive on time does not even enter our minds—rather should we be astonished if he failed in the object of his journey. But it is nevertheless all very wonderful and eloquent of the marvellous progress that has been made towards the goal of the conquest of the air. By the time we find ourselves in the throes of another general election we shall have political agents sending round to the clubs, asking that aeroplanes should be put at the disposal of the candidates for the conveyance of electors to the poll. It may sound a little far-fetched, perhaps even somewhat grotesque, but in the light of past progress he would be a bold man who would pronounce it an impossible proposition.

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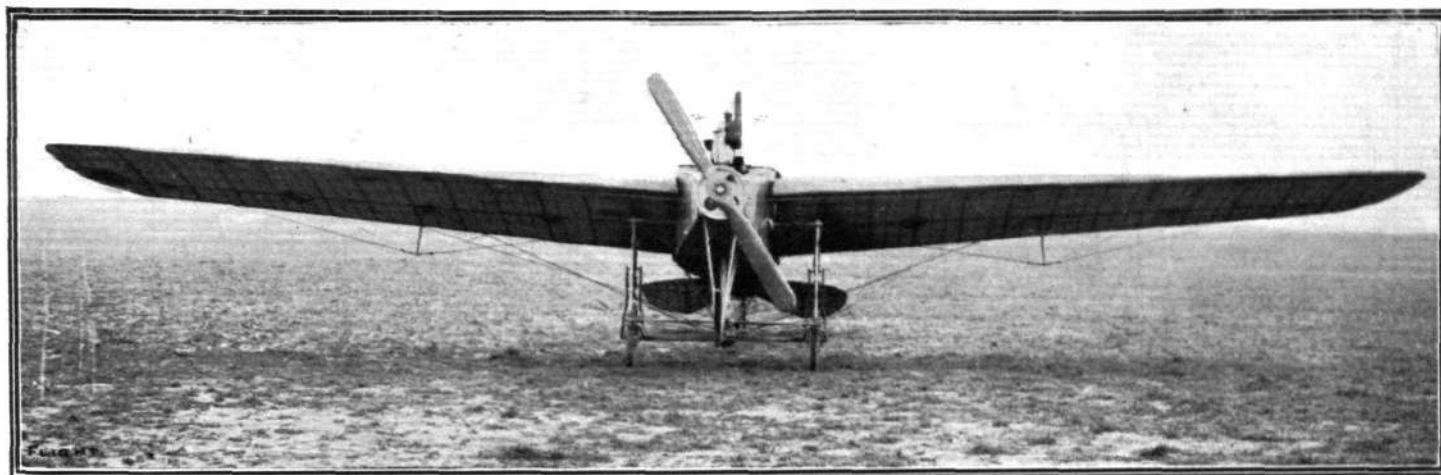
**Aviation
in the
Naval
Estimates.**

In his speech introducing the Naval Estimates, Mr. Winston Churchill said comparatively little regarding the Admiralty policy towards aviation but what he did say was to the point and, in the main, satisfactory. The Navy has acquired land adjoining the R.Ae.C. Eastchurch aerodrome and buildings and sheds are in course of erection. Already the Navy possesses a certain number of good aviators, and these are to be increased as rapidly as possible during the year, while the First Lord hopes that before the lapse of many months regular flights of aeroplanes will be attached for ordinary service to the various squadrons and commands of the fleet. "I can assure the House," he said, "that the greatest importance is attached by us to a thoroughly good and effective development of this service, and money will not stand in the way of the necessary steps." All of which is good hearing, for it leads necessarily to the conviction that the authorities have at last recognised the pressing importance of this new factor in problems of offence and defence. The principle having been thus granted and established, it only remains now to formulate a definite comparative policy, relative to the constructional plans of our possible rivals and that is the duty of the expert advisers of the Government backed by a strong and united public opinion. The last is a very necessary adjunct to aerial policy and simply because we have expressed ourselves as satisfied in principle with the First Lord's statement, we would not have it thought that we are of opinion that there is no more to be done but sit still and watch things. This is by no means the case and quite as much in the future as in the past it will be necessary to keep a very watchful eye on progress and development abroad.

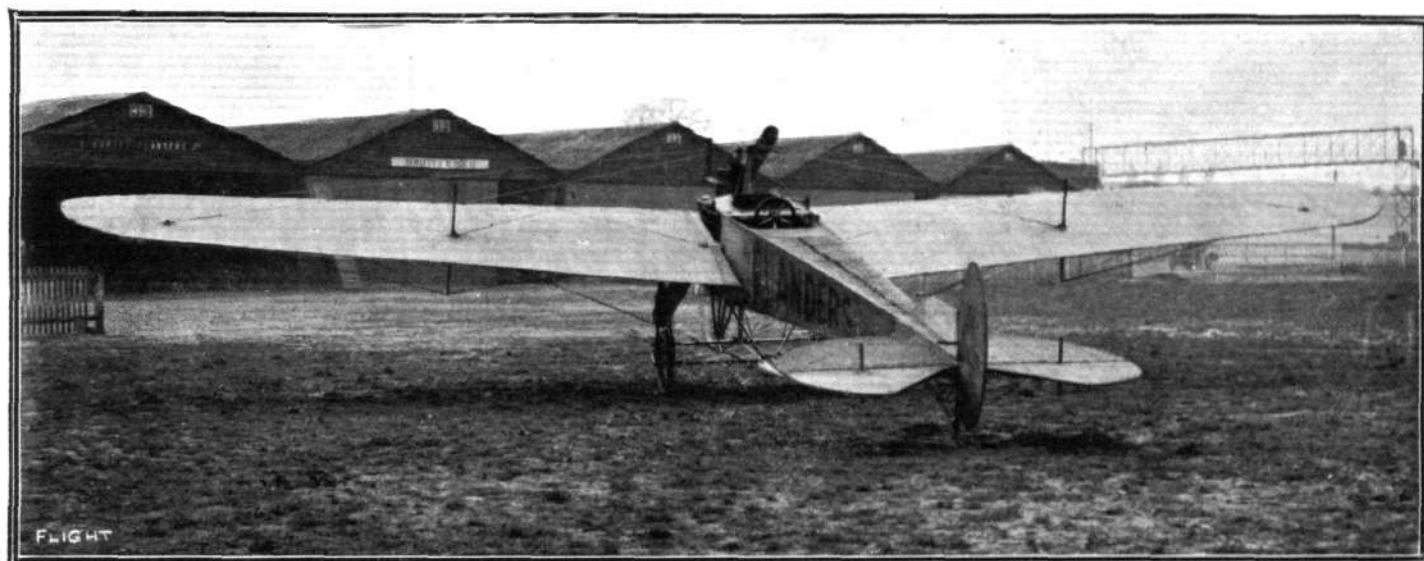
THE FLANDERS MONOPLANE.

To Mr. L. Howard-Flanders must be given the credit of having produced a distinctive and highly original monoplane. Although in its general appearance it does not differ a great deal from its con-

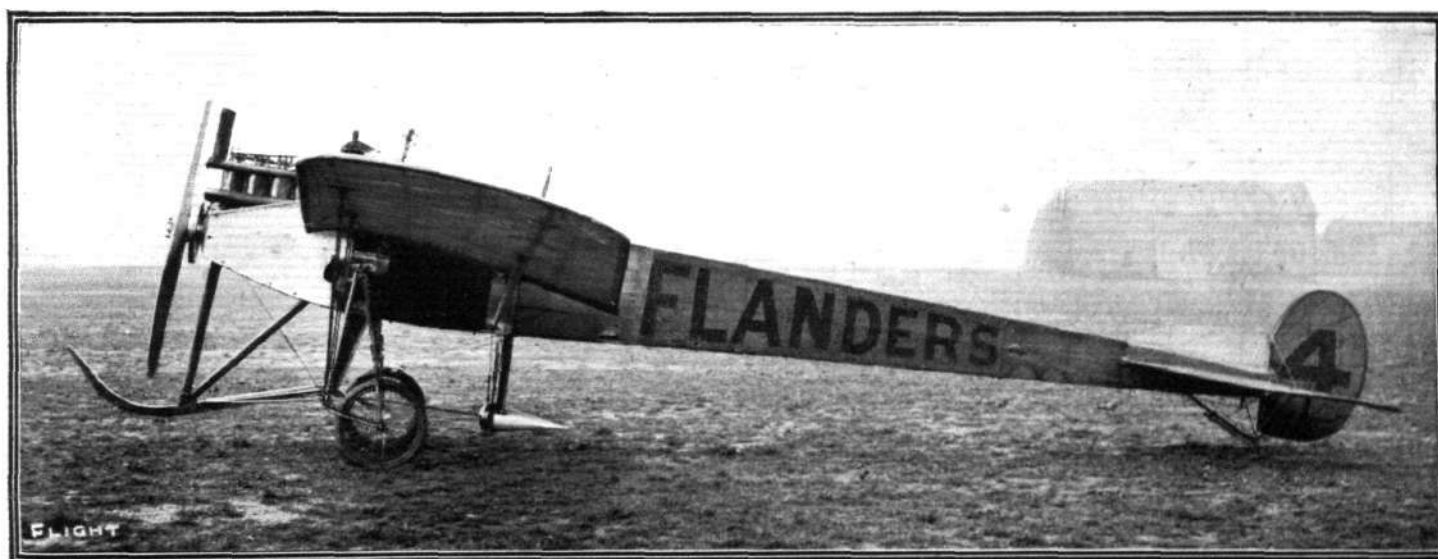
temporaries of the same type, a closer study reveals so many features of real interest that the machine may almost be termed an encyclopædia of constructional methods for the aeroplane builder. Further,



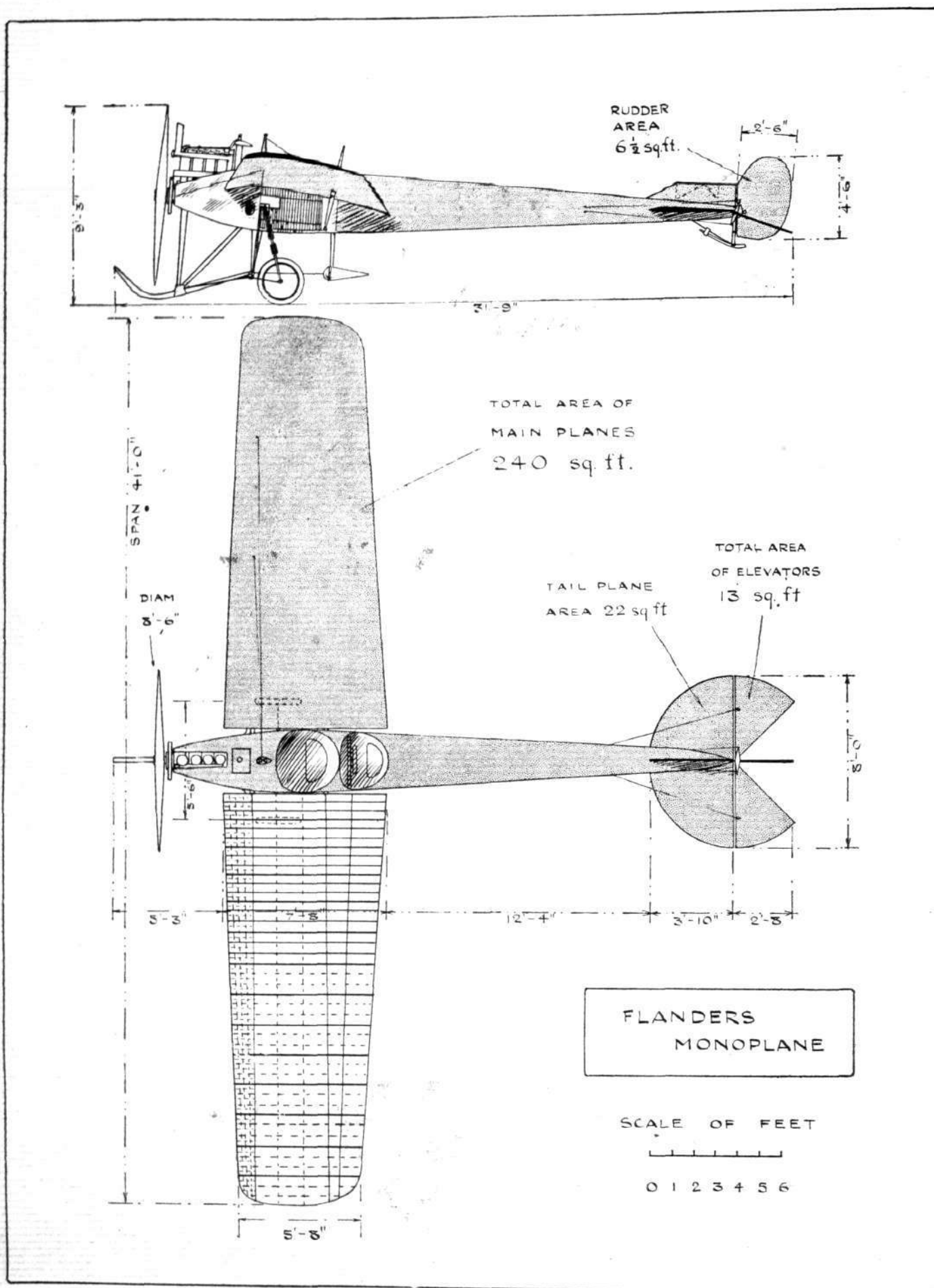
The Flanders monoplane, front view.



The Flanders monoplane, as seen from behind.



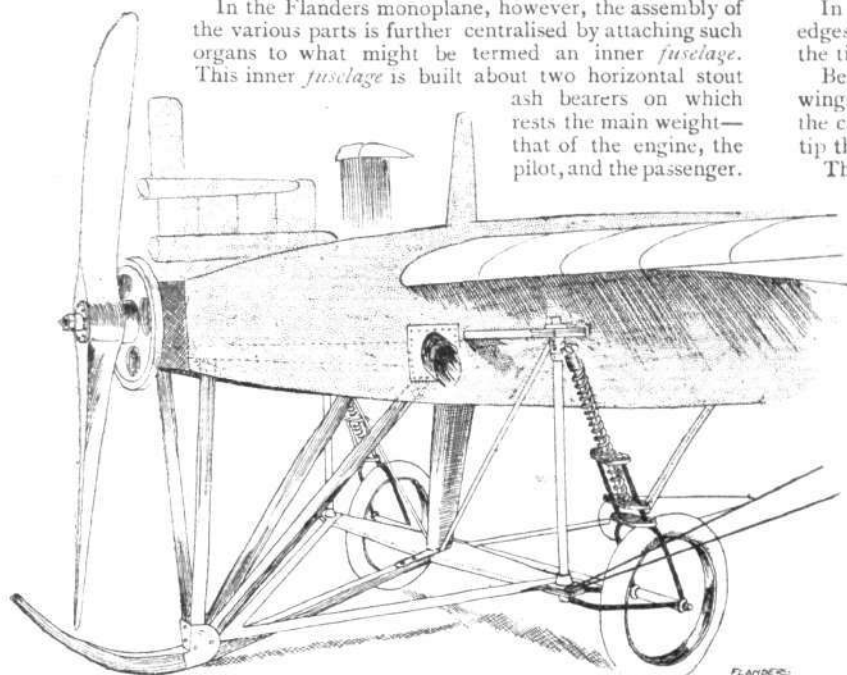
The Flanders monoplane, as seen from the side, giving an idea of the stream-line form of the body.



THE FLANDERS MONOPLANE.—Plan and elevation to scale.

it is characterised by gracefulness of outline that would be difficult to excel, and this carries much weight with the lay observer, beside being also to the credit of the designer, for no one would wish to build an ungainly object to perform such a graceful art as aviation. It is in England that Mr. Flanders has obtained the whole of his experience in connection with aeroplane construction, but it is evident that he has, nevertheless, relied more on the creative power of his own mind for inspiration in his work than on the published descriptions of well-known foreign machines. Undoubtedly the most notable feature about the Flanders monoplane is the method of assembly of its respective sections. Up to the present, constructors have, in this type of machine, employed a girder-like body as the backbone of the machine, to which all other organs, such as wings and landing chassis have been directly attached.

In the Flanders monoplane, however, the assembly of the various parts is further centralised by attaching such organs to what might be termed an inner fuselage. This inner fuselage is built about two horizontal stout ash bearers on which rests the main weight—that of the engine, the pilot, and the passenger.



Sketch showing general arrangement of the front section of the Flanders monoplane.

To it the landing chassis is directly attached, so that the weight may be supported direct, and not *via* the main body of the machine. This system seems so fundamentally sound and eminently simple that it is rather surprising no one has adopted it before.

Mounted nearly vertically at a point mid-way between the motor and the pilot and forming a unit with the engine bearers is a massive wooden mast, from each end of which the wings are braced, from the bottom to take the weight of the machine in flight, from the top to support the wings when at rest. Thus the functions of the main body, relieved of most of the stresses resulting from flying and landing, are merely those of forming a stream-line casing to contain as

many of those parts as can conveniently be located in its interior and of serving as a support for the tail unit. It is entirely covered in by fabric and shaped to a fair stream-line form. Of the customary box-girder type of construction, its longitudinal members are of hickory in the front section of the machine and of a lighter wood, Honduras mahogany, to the rear.

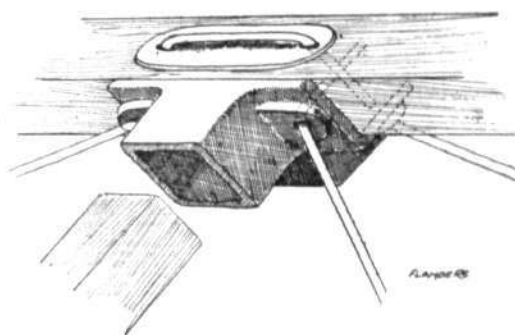
The transverse struts are of ash in the region of the engine and the tail, and between these two points silver spruce is employed. Quite original is the method of wire bracing as can be seen from one of our sketches. The method is almost analogous to sewing the structure together.

The body is perfectly symmetrical about its longitudinal axis, which is dead level in flight, and has a maximum depth of 3 ft. just in advance of the pilot's seat.

In plan form the wings are trapezoidal, both entering and trailing-edges tapering from 7 ft. 8 ins. at the wing root to 5 ft. 8 ins. at the tip.

Besides diminishing in chord measurement towards the tip, the wings also diminish in camber and angle of incidence. At the root the camber is pronounced, and the angle of incidence is 7°. At the tip the camber is nil, and the angle of incidence is similarly nil.

The workmanship evident in the wing construction is of the highest order. Both front and rear spars are fashioned from English ash and are of H section. They are set parallel in the wing skeleton and united by thirteen $\frac{3}{8}$ in. solid whitewood ribs, flanged top and bottom by strips of ash 1 in. by $\frac{3}{16}$ in. Besides these solid ribs a large



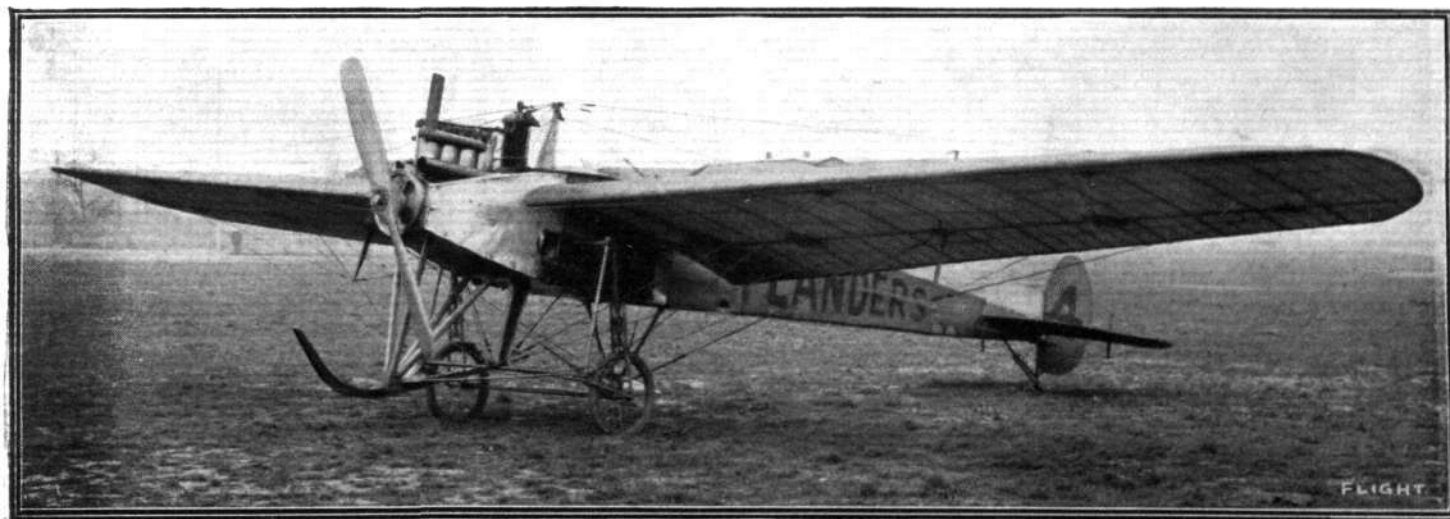
Sketch illustrating the Flanders method of cross bracing.

number of false ribs and longitudinal stringers of silver spruce are employed to give the fabric an efficient support.

The dihedral angle is 3°.

In flight the weight is sustained from each wing by three steel ribbons proceeding from the landing chassis to the front spar and by three stranded steel cables connected to the rear spar. These latter also operate the warping for lateral balance, a maximum deflection of 9 in. of the rear spar being allowed.

The landing-chassis is of the wheel-and-central-skid type. The wheels are mounted to the steel columns forming the sides of the rectangular chassis skeleton by tubular-steel forks, comprising two



The Flanders monoplane, three-quarter front view. The general arrangement of the landing chassis is clearly seen.

sides of a deformable triangle of which the column is the third. The pair of forks representing the longest side are rendered flexible by the interposition of steel compression-springs. Two-and-a-half-inch tyres are employed on the 26-in. wheels. A central skid proceeding from the centre point of the chassis extends below and in front of the propeller to protect it and the machine should an obstruction tend to cause it to tip towards the nose.

The shape of the tail in plan form may be represented by a circle of 4 ft. radius, from which a 90° sector has been subtracted to provide the space for the directional rudder to operate.

Although the stabilising tail is purely of the floating type, it is not flat, but to give rigidity it is cambered equally on both top and bottom surfaces.

Just lately a small vertical fin has been added to the tail to

improve the equilibrium of the machine in a side-wind. A small flexibly-sprung skid insulates the tail from ground contact.

The controlling gear is very similar to that adopted by the Deperdussin firm, and comprises a rotatable hand-wheel mounted in the centre of an inverted U-shaped bridge of steel tubing. Lateral equilibrium is corrected by rotating the hand-wheel, and a to-and-fro motion controls the elevation. The steering is operated by a foot-bar, pivoted centrally.

Provision is made for a passenger in a capacious cockpit, just in front of the pilot's seat. A 60-80-h.p. Green engine, which has been effectively silenced by the fitting of a miniature muffler of stream-line section, has all along proved an eminently satisfactory power plant. It drives a direct-coupled Régy propeller of 8 ft. diameter and 6 ft. pitch.

THE NAVY ESTIMATES AND AVIATION.

MR. CHURCHILL, during his introduction of the Navy Estimates in the House of Commons on Monday, referred only briefly to the aeronautical side of the Estimates, as so much had been said, he pointed out, in the Army Debates during the last few days on the subject of aviation that only a passing reference to the naval aspect was required. Early in November he and the Secretary for War agreed together that the War Office and the Admiralty should work together in the development of this vital and important new service. A Sub-Committee of the Committee of Imperial Defence was set up, which, under the guidance of the Under-Secretary for War, had produced a bold, far-reaching, and carefully considered scheme. The Admiralty was very much indebted to Col. Seely for the service he has rendered in this connection. They had now acquired some land at Eastchurch, adjoining that of the Royal Aero Club, who courteously gave them the use of their aerodrome for flying purposes. The buildings and sheds for a naval aviation school were in course of erection. A considerable number of aeroplanes, both for training and experimental purposes, had been purchased, principally in England. Some of these were being adapted for the special needs

of the Navy. They did not require the Navy to develop aviation on the same great scale as in the Army. They had already a certain number of good naval aviators, and they were going to increase them as rapidly as possible during the year.

Mr. Churchill hoped it would not be many months before regular flights of naval aeroplanes could be attached for ordinary service to the various squadrons and commands of the fleet. He could assure the House that the greatest importance was attached by them to a thoroughly good and effective development of this service, and money would not stand in the way of any necessary steps.

In regard to the actual amount, they had taken in the Estimates as much as they could spend. Although there was no money taken in the Estimates for the purchase of dirigible balloons or dirigible airships, it ought not to be supposed that that subject was not also engaging unremitting attention, especially the latest developments.

Incidentally, it also transpired from Mr. Churchill, when dealing with the possibilities of oil as a motive power for battleships and the difficulties of the storage of fuel, that the Government had in mind the necessity of guarding against attack by aeroplane



Capt. Gordon at Eastchurch flying grounds, another competitor for the Mortimer Singer Naval and Military Aviation Competition.

WHAT IS DOING ABROAD.—WAKE-UP ENGLAND!

A FEW days ago we received something of a shock when a very good friend of FLIGHT sent us a criticism of what he described as a paucity of foreign news in its pages. Now, we had always considered that we had devoted a fair amount of space to what is doing abroad, not only as a matter of interest to our readers, but with the object of educating the British public to realise the advances being made abroad in aviation. No notable performance escapes us, and many which in these days of phenomena have ceased to be even remarkable, are chronicled. No new development in *matériel* takes place but what it is dealt with in the order of its importance, and, on the whole, we had really thought we were doing the thing rather well. And then we have this friendly criticism sprung upon us!

Our critic, it is fair to ourselves to say, had just returned from a tour of the French flying grounds, and, to use his own simile, aeroplanes were so numerous in the sky that they reminded him of swarms of gnats on a fine summer evening, which doubtless many of our readers who are not fully familiar with the hold aviation has obtained in France, may think is verging on exaggeration. But to show them it is not, and also to justify ourselves against our critic, on the ground that it is utterly impossible to take note of everything in a weekly journal such as FLIGHT, we append a free translation of the record of *one day's* doings as recorded in a leading Paris daily which devotes close attention to aviation. We have not in any way selected the issue from which we take these records—it is simply a typical daily chronicle of flying news, and even this record probably takes no note of hundreds of other flights taking place throughout France during the day. With this explanation we leave the translation to speak for itself—it needs no comment from us.

Résumé of One Day's Aviation Work in France.

Lieut. Francescon mounting for the first time a Blériot-Gnome monoplane passed successfully the first test for a military superior *brevet* over a course from Etampes to Beaugency and back.

Some consternation has been caused in French naval circles by the announcement that Commandant Daveluy is giving up the direction of naval aeronautic services, and is returning to his former post.

Yesterday, at Nice, Laurens, on a Deperdussin monoplane, flew over the town with a lady passenger at a height of 800 metres and gained the prize offered by the Nice Aero Club.

At St. Raphael the flying week opened yesterday with calm weather, and Hanouille, on a Blériot-Anzani, flew over a course Valescune-Frejus and back for the Prix des Hoteliers, and with his wife he made another flight for the Prix des Commerçants. Both performances were loudly applauded.

The Day's Work in the Schools.

Amberieu.—Starting from the Deperdussin grounds Vidart flew in the direction of Lyon and landed at the Bron aerodrome. On his return he had an enthusiastic welcome from a number of officers from the Valbonne Camp, who were visiting the Deperdussin school. While passing over Lyon Vidart dropped a shower of paper roses each bearing the reminder *Donnez votre obole pour les avions*.

Buc.—*Farman School.*—Lieuts. Faucombre and Trescarte each made good first solo trials; Bernard gave long lessons to Lenoble, Lieut. Courret, Honoré de Lareinty-Tholozan, and Viscount de la Riboisière; M. Farman gave the Viscount de Paris his first taste of flying; Marquis de Lareinty-Tholozan carried passengers; Adjudant Drevet and Cavalry-Sergeant Quennehen flew from St. Cyr to Buc and back; Lieuts. Vaudein, Vitra, and Naval Lieut. Reynaud put in some scouting practice; Barbaroux, Irat, Sallard, Senocque, Rallier du Baty each made long flights; Renaux, with Lieut. Bordage, and Lieut. Micaud, with his mécanicien, flew back from Mailly camp.

R.E.P. School.—After his fine flight at the Vincennes review, Gordon Bell gave a splendid demonstration above the aerodrome, and took up Lieut. Campagne and flew with him for an hour. He then took up Mme. Berthe Noutte on the school machine, and also M. Andre Rougier. During this time Capt. Coville and Lieut. Maurice made a long trial on their military-type machine.

Chartres.—At the Savary military school on Sunday morning Penet passed the three tests for his *brevet*, while at the civil school Lecontellec also made the three tests. To-day they have been practising high flying. Saulguin and Rabatel are nearly ready to make the tests. Frantz and Reichert each made good flights, and Hembert gave instruction to new pupils.

Courcy.—*Deperdussin School.*—Lieuts. Chabot, Dietrich, Schlumberger, Fournier and Ruffene each made splendid flights, while chief pilot Bielovucic was up to a good height; Cavalier is training for a superior *brevet*, as also are Lieuts. Chabot and Dietrich, both of whom should have little difficulty in qualifying very shortly.

Crotoy.—*Caudron School.*—Lieut. Bon flew for 1 hr. 50 mins. over the country; Sapper Jacquemart covered a circuit comprising Le Crotoy-Rue-Arry-Le Crotoy; pupils Delacornoguc, Bauvais, Castagneris and Marty each made "eights" at a good height under the direction of chief pilot Delaet; Lieut. Peralda was flying high; Gaston Caudron was carrying passengers; and Rene Caudron flew to Arry and back, with Maurice Harent as passenger. He afterwards carried Maurice Marty and de Longpre. Rene Caudron made several tests over the bay with the biplane fitted with Fabre floats and started up from and alighted on land and sea alternately. His usual altitude was about 200 metres.

Etampes.—*Farman School.*—Brouard passed all three tests for his *brevet*. Chevillard flew with Lieut. de la Bedolliere and Birch, while Gouguenheim took up Amans and Leonardi. Naval Lieuts. Delevoeye, Kamberes and Adamidis each made cross-country flights and Montoussis was practising.

Blériot School.—Capt. Felix and Sapper Letor were testing two-seater Blériot machines, while Lieuts. Le Bleu, de Ville d'Avroy, and de la Morlaye were out on single-seaters.

Juvisy.—L. Demazel took Holmer, the winner of the International cross-country race for an aerial trip on his Farman biplane, and the pupils Nerve and de Zeff were training.

La Vidaméz.—*Borel School.*—The pupils Voigt, Belier, Fischer, Conrad, Spitzauer, Cardot and Lieut. Godot and Fournier made instructional flights, and Lieuts. Samson and Sansal qualified for *brevets*, the landings in both cases being splendidly timed.

Mourmelon.—*Sommer School.*—Lieuts. Mailfert and Bosquet were out on monoplanes, and Bathiat tested four new military monoplanes fresh from the works. The pupils, Lieut. de Clerck, Baroness de Shrenck, David and Revelli each made several rounds of the course. Robinet carried several passengers on his biplane, and Bathiat gave *le baptême de l'air* to his nine year old son. At the Sommer works, Capt. Destouches saw some wings being tested with sand.

Voisin School.—Grassat, just back from the Pau School is training for a military certificate. Lieut. Greppo made a cross-country flight, and De Ridder gave instructions to pupils Carriere, Boiseau and Seyrat.

Train School.—Capt. Schreegans made a cross-country trip at a great height, while Lieuts. Levassor and Remy were flying over the camp. Naval-Ensign Lafon took delivery of his machine. Cure was out with a passenger on the two-seater machine, while Desorne was testing one with an Anzani motor.

Pau.—*Deperdussin School.*—Good flights were made by pupils Lieut. Jannerod, Aubry, Brocard, Radisson, and non-commissioned officers Abadie, Verdier, Guiton, Chauroux; chief pilot Franceq flew over the town; and Rivollier gave instruction to the following pupils of the civil school—Griolet, Small, Scoffier, Curntchet, De Fraville, de Slanski, Guglielminetti, Rousseau, Mdles. Faina and Vandersy, and Countess de Coligny Chantillon.

Blériot School.—Lieuts. Dupin and Loubignac, the latter after only a month's tuition, each made an hour's flight. Fondere passed the tests for his *brevet*; Lieut. de Dorges and Crawshaw and Angstrom were practising the art of *vol plané*. At the military school, Capt. Faure, Lieuts. Sevelle, Jacquet, Willermes, and "non-com." officiers Feisterstein, Perretti and Laurent were practising spiral descents. Deneau flew back from Tarbes, where he has been giving exhibition flights. Simon still supplies a few thrills during the day.

Nieuport School.—Lieut. de Montjoue, on a 28-h.p. Nieuport, paid a visit *par les airs* to the golf club by invitation. Lieut. de l'Estrade and Bauwens made good flights, and Chelle and Canal were training. At the civil school Lieut. Illyne (Russian), Lieut. Herrera (Spanish), Lieut. Gazero (Italian) each made lengthy trials, as also did Levasseur; Lieut. Dibowsky (Russian) commenced his tuition. Pilot Maudelli tested several new machines, and gave instruction to Miss Lottie Brandon, Maille, and Beaudoin.

Rheims.—*Hanriot School.*—Perrin made several good trials, and Marcel Hanriot flew over Rheims for an hour at a height of 1,500 metres. Hanriot *père* made a long flight, and also took Ponnier for a trip. Dubreuil took delivery of a machine with Rossel Peugeot motor.

Clement-Bayard.—Chassagne flew for an hour at a good height and afterwards carried passengers, including MM. Mane and Carpentier and Mme. Emma Liebel.

St. Cyr.—*Farman School.*—Lieut. Leclerc, Cheutin, Coville and Capt. Etene were practising high flying. Lieut. Marmies and Sapper Grandjean made the third tests for military *brevets* over a course from St. Cyr to Bonneval and back.

Zodiac School.—Pierre Debroutelle passed his tests for his certificate at Bois d'Arcy, and then flew to St. Cyr, keeping mainly at a height of 200 metres. He was accompanied by his instructor, Jacques Labouchere.

EXPERIMENTAL RESEARCH AT THE N.P.L.

ACCORDING to custom, the National Physical Laboratory celebrated the conclusion of its official year by holding a reunion at Bushey House on March 15th, which was attended as usual by most of the leading engineers and scientists in the country.

Aeronautics, which is the only department of the N.P.L. that properly comes within the scope of editorial recognition in these columns, forms but a small fraction of the scientific ground that is covered by the work of this invaluable institution, yet, as may be seen from the report of this section published elsewhere, the aeronautical work accomplished and in progress is large both in variety and importance.

Experimental research of the kind that is undertaken at Teddington requires the most painstaking preparation, and a year seems but a moment of time when it comes to laying down and calibrating the apparatus, and making all the preliminary investigations that are essential to ensure accuracy. As yet this department of the laboratory is only on the fringe of its great subject, but it is making good progress and the time is not far off when the English aviation world will realise that in the N.P.L. it has an asset unsurpassed for value by the laboratories of any other country in the world.

The bare report that we give practically in extenso, is not, perhaps, so informative as it might be, but there is much in it that will arouse interest. The references to tests on wing sections in particular will attract the notice of all our readers, and we feel justified even at the risk of error, in supplementing what is there stated by the gist of the information that it was possible to obtain in the course of conversation during the visit. Thus far, the experiments on wing sections have been mainly confined to sections having a flat underside, and the tests have investigated the effects of varying the altitude (angle of incidence of chord to line of flight) and varying the camber of the *upper* surface alone, by altering the maximum thickness of the section.

It seems that the upper and lower surfaces of a wing section should be separately investigated, as they have different characteristics.

It is also evident that the upper surface is both the most interesting and the most important; it contributes perhaps three times as much lift as the lower surface to the support of the machine, and it is on the upper surface that the critical changes of flow, causing sudden variations of lift, takes place.

The nature of the flow over the under surface conforms to the contour of the surface, and the distribution of pressure is such that a maximum value not exceeding $\cdot 5\rho v^2$ is obtained in the vicinity of the leading edge for small angles of incidence. Over the upper surface, the flow adheres to the fabric for a short distance and then becomes turbulent. At angles of incidence exceeding a critical value, somewhere about 10° to 16° , this turbulence becomes "dead water," due to discontinuity of flow, and gives rise to a sudden loss of lift coupled with an increase in the drift resistance.

The distribution of negative pressure is such that a maximum value, perhaps in the order of three times ($\cdot 5\rho v^2$), occurs in the vicinity of the leading edge. This distribution accounts for the forward inclination of the resultant pressure, which is the secret of the low co-efficient (ratio of drift to lift) of the cambered wing as compared with the flat plane.

Any wing section that might be considered reasonable for practical use ought to begin to manifest a positive lift in a *negative* altitude of about $2\frac{1}{2}^\circ$. The lift and the co-efficient vary with the altitude, but they also vary with the camber for a constant attitude, consequently the angle of incidence is *not* the only significant angle in calculations affecting the cambered plane.

The lift increases and the co-efficient decreases with an increase in the maximum thickness of a section that has a flat under surface: in other words some function of the camber represents the effective angle over and above that obtained from the altitude of the wing.

Variations in the position of the maximum camber along the chord are of relatively small importance, as also are changes in the surface contour of a section having a given maximum camber.

For an attitude of zero degrees angle of incidence, the thinnest plane that is structurally strong enough to do its work will have the lowest co-efficient: in other words the angle of least resistance for a given loading has a very small numerical value.

The lift of a wing obeys the v^2 law, and the co-efficient of flight is independent of speed. At present the lowest co-efficient obtained from experiments is $\frac{1}{18}$ ($= \cdot 0625$). It should be easy to construct a wing having a co-efficient of $\frac{1}{18}$ ($= \cdot 077$), but it may be assumed that any good practical wing has a co-efficient not greater than $\frac{1}{10}$ ($= \cdot 1$).

Skin friction has been found from experiments on model dirigible envelopes to approximate to the formula and co-efficient established by Zahn, when corrected so as to conform with the theory of aerodynamical similarity; that is to say it may be regarded (for rough-and-ready calculation only) as somewhere in the order of the values

obtained by the simplified expression $R = \cdot 000018 V^2$ lbs. per sq. ft. of double surface for speeds up to 70 m.p.h.

In an average biplane it has been estimated that the body resistance (struts, wires, undercarriage, engine and pilot) is somewhat more than half the total resistance, hence the practical co-efficient of flight (gliding angle) may be expected to be in the order of $(2 \times \cdot 1) = \cdot 2 = 1$ in 5.

Also, it is evident that the greatest opportunity for reducing the power required for a given speed lies in the reduction of body resistance rather than in the improvement of wing section. Any improvement in this direction has an immediate and important effect: the mere shaping of the struts might make all the difference with regard to being able to carry a passenger under given conditions.

In struts, the best practical section, having regard to strength and weight, is probably one having a fore-and-aft length about three times the greatest breadth. For stream-line bodies, however, this ratio might be extended to, say, 6 to 1, with advantage. The entry must be blunt, but slightly pointed rather than hemispherical. A hemispherical head should always be followed by a parallel body for a short distance before the sides close in for the run.

The run should not be curtailed, even if the flow does not adhere to its surface, for by doing so the resistance is increased by the region of dead water thus established.

In the cambered wing section, it is similarly important to distinguish between the turbulence, that is a normal characteristic of the flow over the upper surface, and the dead water that is enclosed by the surface of discontinuity, created when the attitude of the plane exceeds its critical angle. The dead water region is also characterised by turbulence, but it is not part of the stream-line system as in the case of the turbulence attending the normal attitude of the plane.

In connection with propellers, it would seem that the general conclusions relating to wing sections again apply. Almost any fair description of two-bladed propeller should give an efficiency between 65 and 70 per cent., beyond which improvement is the result of a combination of refinements that it is difficult properly to correlate.

Progressive research still continues to support the doctrine that all fluids are fundamentally alike in their behaviour, and that model experiments in water are a reliable index to the full-scale conditions in air.

The following details are abstracted from the official report of the N.P.L. for the year 1911:—

Satisfactory progress has been made with the researches carried out in accordance with the programme laid down by the Advisory Committee for Aeronautics. Among these researches may be mentioned specially the investigation of the efficiency of a number of aeroplane surfaces, including a careful study of the distribution of air pressure, and the nature of the flow round such surfaces. The determinations of the air resistance of smooth wires, of standard ropes, and struts of different forms, are also of interest. The tests of motors entered in the second competition for a prize of £1,000 offered by Mr. Patrick Alexander were completed towards the end of the year.

A very complete series of weathering tests of balloon fabrics has been completed by Mr. Barr.

Wind Channels.—The following investigations will be carried out in the existing 4 ft. channel and the new 4 ft. channel when completed.

1. A complete series of tests on the lift and drift of wing forms, together with observations on the effect of aspect ratio.
2. Study of the effect of warping the trailing edge of a wing form up and down.
3. Determination of the most suitable "gap" in biplanes.
4. Continuation of the work on the best form of strut.

Water Channels.—It is proposed to continue the investigation into the stability of dirigibles.

Air Channel for Visual and Photographic Work.—A new channel for this work will be completed early in the year. The channel will be mainly employed for visual and photographic observations intended to serve as a guide to the direction in which progress may be expected in the experiments in the larger air channels.

Whirling Table.—It is proposed to continue the propeller experiments, especially as to the effect of blade area and pitch on the amount of power available from a propeller of given diameter.

Wind Towers.—It is proposed, if the research on the lateral variation of wind velocity is completed this year, to make experiments on the resistance of a full-sized aeroplane wing in the natural wind for the purpose of comparison with the resistance of a similar model in the wind channels.

Strength Tests of Fabrics.—The following work is proposed:—Compound stress tests on diagonally double fabrics in continuation of the work on parallel doubled fabrics. Tearing tests on large specimens

A programme of investigation, chiefly concerned with the properties of balloon and aeroplane fabrics, will be carried out as approved by the Advisory Committee for Aeronautics.

The Friction of Air Currents in Pipes. (Dr. Stanton and Mr. Pannell).—The experiments on the distribution of velocity in the cross section of a pipe through which air is flowing, together with the measurement of the fall of pressure in the axial and radial directions, referred to in the Report for 1910, have progressed sufficiently to enable the relation between the shearing stress and rate of change of distortion in the fluid to be determined. Following the nomenclature of Osborne Reynolds, who first called attention to the difference between the shearing stresses in "laminar" and in "eddy" motion, this shearing stress is here called the "mechanical viscosity." Thus if F is the average shearing stress on the surface of any cylindrical portion of radius r of the fluid coaxial with the pipe through which it flows, and v the mean axial velocity of the fluid at this radius, then, writing $F = \mu' \frac{dv}{dr}$, the quantity determined by the experiments was μ' , the coefficient of mechanical viscosity, expressed as a function of the velocity of the fluid and the dimensions of the pipe.

Experiments were made on pipes of two kinds.

1. Pipes in which the surface was artificially roughened in such a way that the friction varied precisely as the square of the speed.
2. Pipes of smooth bore in which the friction varies as a power of the speed appreciably less than two.

In the case of the artificially roughened pipes it was found that the distribution of velocity across the pipes was such that if a curve was plotted whose ordinates were the ratios of the observed velocities to that of the centre filament, and the abscissae the ratios of the corresponding radii to the external radius of the pipe, then this curve up to within a relatively small distance from the boundary was a parabola, and expressed the motion at all speeds and in all pipes. From this relation it follows that for pipes in which the friction varies as the square of the speed:—

1. From the parabolic form of the velocity curve μ' is constant across the pipe for any given speed of flow.
2. Since the rate of distortion is proportional to the speed of flow and the shearing force is proportional to the square of the speed of flow, μ' is proportional to the speed of flow.
3. For two pipes of different diameters since the shearing forces are the same at the same speeds of flow and the rates of distortion are inversely proportional to the radii, μ' must be proportional to the radius. The expression for μ' is therefore of the form $KV_c L$ where V_c is the velocity of flow, L the linear dimension of the pipe and K a constant depending on the roughness of the pipe.

In the experiments on smooth pipes, the identity in the velocity curves at varying speeds and diameters was found not to exist, and the expression for the mechanical viscosity was much more complicated, being given by $\mu' = C.V_c L f\left(\frac{v}{V_c L}\right)$, where v is the kinematical coefficient of viscosity of the fluid. A paper on the results of the experiments has been published in the Proceedings of the Royal Society. A Vol. 85, 1911.

The following researches, of which a detailed account is given in the Report of the Advisory Committee for Aeronautics, have been carried out during the year:—

1. *Wind Channels.*—a. The determination of the forces on, and the efficiency of, aeroplane wing forms, including investigations into the distribution of pressure over the surface. This forms part of a definite scheme of research of some magnitude undertaken for the Aircraft Factory, and will be continued during the coming year. Among other questions, the effect of separate variation of the upper and lower surfaces of an aerofoil has been studied.

b. Determination of the flow of air round aeroplane wing forms by means of smoke trails. This work is being undertaken with a view to determining the direction in which improvements in wing forms may be expected, and has rendered assistance in the prosecution of the previous research a.

- c. Measurement of the lift and drift of a model Paulhan girder.

- d. Determination of the resistance of wires and ropes.

These tests were made on wires and ropes ranging from 0.04 to 0.25 inches diameter for smooth wires, and from 0.1 to 0.5 for stranded wire and hemp ropes.

The air resistance of the stranded ropes was found to be approximately the same as that of small square plates, the area being considered as the product of the diameter and the length. The smooth wires gave a resistance approximately 20 per cent. lower.

The effect of vibration of the wire in any direction was found to be negligible, so far as the aerodynamic resistance is concerned.

2. *Experimental Water Channels.*—a. Determination of the moments on 12 model dirigibles when inclined to the current.

b. Photographs of the flow of water round model dirigibles in a tank specially constructed for the purpose. The experiments in the

water channels showed clearly that even for an elongated fish-shaped airship model the relative velocity of flow near the tail is considerably less than in the main stream.

- c. Investigation of the eddying motion in the rear or plane and curved surfaces. These experiments demonstrated the existence of two distinct types of flow for the same surface at different velocities.

3. *Whirling Table.*—A new dynamometer has been constructed to enable the range of the experiments to be increased. For experiments with fairly high values of slip it has been found necessary to augment the frictional resistance of the whirling table by the provision of a rope brake, while arrangements have been completed to enable higher propeller speeds to be attained.

The research into propeller efficiency has been continued, special attention being given to the effect of blade area.

Tests on the Mechanical Strength of Balloon Fabrics.—The laws of compound stress for balloon fabrics have been investigated as far as concerns single fabrics or fabrics composed of two layers applied to each other warp on warp. It was anticipated from theoretical considerations that the breakdown stress would be slightly lowered by the presence of a stress in the direction at right angles to the principal stress by an amount depending chiefly on the fact that each short length of yarn from one cross yarn to the next is inclined to the plane of the fabric; the elastic deformation of this angle also modifies the result. To check this theory six sets of five bags of a double parallel fabric (No. 1,007 made by the Continental Tyre and Rubber Co.) were tested under various ratios of compound stress in the apparatus previously described. The results agreed with the theoretical prediction within the comparatively large variability which is always exhibited by fabrics. Great simplification can be introduced into strength tests on fabric for dirigible balloon construction by the use of the following empirically simplified form of the laws of compound stress:—

For single or for double parallel fabrics breakdown under compound stress is reached a little before the maximum stress attains a value equal to the breakdown strength of the material as determined by simple tensile tests. For cotton the weakening effect may be taken as 5 per cent. for equal stresses (the case of a spherical balloon) and 2½ per cent. for a 2:1 ratio of stresses (the usual approximate condition in an elongated dirigible balloon envelope). *This does not apply to double diagonal fabrics.*

Preliminary tests on wounded specimens of fabric under compound stress have been made, using a cross shaped specimen which gives results of sufficient accuracy for ordinary purposes. From these tests the following preliminary conclusion has been deduced:—

For single or for double parallel fabrics the factor of safety for tearing under a 2:1 ratio of stress appears to approximate to the value determined in simple tension by the method previously described. *This does not apply to double diagonal fabrics.* The case of double diagonal fabrics is being further investigated.

A report on some preliminary work on the time curve for the deterioration of unprotected rubber-proofed fabrics after exposure to the weather was presented to the Advisory Committee early in the year. An extensive scheme of investigating the rate of deterioration of eight typical balloon fabrics derived from various sources was then undertaken. The specimens for exposure were placed under cover at night, being run in and out from a door in the gable-end of a roof of the chemical laboratory on to a lead-covered roof flat by means of a specially constructed trolley and rails. One half of the specimens were exposed on both wet and dry days, and the other half on dry days only. The specimens were tested for both tensile strength and permeability to hydrogen at regular intervals, and in most cases a clearly marked difference between the two series could be found in the results. A full account of the results will be given in the Report of the Advisory Committee for Aeronautics for the year 1911-12.

The extent to which water adheres to balloon and aeroplane fabrics has been investigated. The materials were either sprayed with water from fine jets under constant pressure, or they were dipped into water and allowed to drain for a short period. It was found that the results from the two methods were in fair accord; the increases of weight observed vary from about 9 to 30 per cent. of the weight of the fabric.

A full-size balloon valve has been tested for tightness to hydrogen, special apparatus being set up for the purpose of determining the rate of escape of gas from the valve both when tightly closed and when a portion of the pressure on the joint was removed.

As balloons are sometimes exposed to very low temperatures, a number of fabrics were tested when frozen to temperatures of from -10°C . to -25°C .; at these low temperatures the fabrics were either (a) crumpled or (b) carefully protected from crumpling. It was found that rubbered materials were practically unchanged by either treatment, but that varnished silks if crumpled at the very low temperatures might show fairly large leakages; exposure for a short time to a temperature from 15°C . however, caused the minute cracks in the

varnish to heal up, and the permeability was then reduced to its original low value.

Some tests on aeroplane fabrics have also been undertaken; both tearing and tensile tests have been performed on seven selected cloths, and the deterioration of these fabrics on weathering is being studied by means of such tests and of stress-strain determinations. The cloths have also been examined as regards the adherence of water, and the amount of sagging to which they are liable when exposed, under slight strain, to alternations of dry and damp con-

ditions is being studied by exposing strips of the fabrics while fixed under initial tension in rigid clips.

Further progress of an encouraging kind has been made during the year with the experiments on special proofing materials for balloon fabrics, and it is hoped shortly to have larger scale trials made on the lines suggested by the Laboratory experiments.

Full accounts and reports of these investigations have been presented to the Advisory Committee for Aeronautics, and will be published in the Annual Report of the Committee.

REFINEMENTS IN BLÉRIOT DESIGN.

IN the new models that L. Blériot is turning out for the year 1912 many improvements on existing design are evident, particularly so on the military machine, which, in view of the circumstances in which it finds general use, is designed so that it may be folded into a space 16 feet long by 6 ft. 6 in. wide by 7 ft. 4 in. high. Exactly how this is effected will be explained later.

On the 50-h.p. cross-country monoplane the motor is so mounted that it may be detached from the machine in one unit with the minimum of trouble, and to render it more accessible the top part of the bonnet has been arranged removable for this purpose. The wings, the construction of which already is altogether above suspicion, have been further strengthened in every part, while steel wire crossbracing has been introduced between the front and rear spars to prevent drift-strains. Improvements have also been made to render the wing trusses stronger and more readily detachable. Close to the pilot on his right hand side, a window has been let into the wing to facilitate his observation of the country directly beneath him. Quite a useful little refinement is the present method of attaching the rubber shock-absorbers to the long fork of the Blériot chassis. These are now attached by means of a quick release clip, operated by a special tool supplied with the machine, so that the machine may be quickly lowered, as it were, on to its knees, and so facilitate the fitting of the wings and reduce the space necessary for its packing.

The chief improvement in the 1912 artillery type is, as has been before mentioned, the ease with which it may be folded up and prepared for transport in covered artillery wagons. To this end the

fuselage is constructed in two parts and hinged together so that the rear part may fold over the head of the front section. The stabiliser at the rear, too, is also arranged to fold up, sections on each side hinging over the central portion and reducing the width of that organ to the width of the front part of the machine.

An official trial of the strength of the new wings of the 1912 Blériot monoplane "type XI" was made on January 19th last, in the presence of the French Military Aviation Committee, composed of General Roques, Colonel Bouttieaux, Colonel Estienne and 30 Officers, all of them certificated military pilots, from Vincennes and Chalais-Meudon.

The machine was turned upside down, the body being properly fixed on trestles, and the wings were weighted with 3,250 lbs. of sand, while at the same time a horizontal traction equivalent to 650 lbs. was applied to both wings. No part of the machine suffered in any way from this experiment. A further 216 lbs. of sand was added to each wing, and they were submitted to the same horizontal traction with again similar results. The weight was again increased, and several trials made, and it was only under a weight of 5,070 lbs. combined with a horizontal traction equivalent to 780 lbs. that the wings began to give way.

Even then the stays and all attachments as well as the fuselage and pylone were intact.

The Military Committee examined every part of the machine, and after consultation made a report that the whole construction of the machine was perfectly satisfactory. The 1912 model has been adopted by the French Army.

M. SALMET'S LONDON-PARIS FLIGHT.

IT appears, after all, that the record for an actual non-stop flight between Hendon and Paris still rests with M. Pierre Prier, as M. Salmet informs us that, having somewhat lost his bearings about 10 o'clock, he thought it wise to make a momentary descent merely to ascertain his whereabouts. This occurred at Saumont la Potteric (Seine Inferieur). Having got his direction, he decided to have a light *déjeuner* before re-starting. The halt was entirely voluntary, and was in no way necessitated, except by M. Salmet's desire to make sure of his direction; and under all the conditions he regarded it as for all practical purposes a non-stop flight, and for this reason did not bother to mention it to anybody, either at the Blériot school or elsewhere. However, M. Prier points out in a letter to us, that, in view of the fact that M. Salmet did actually come to earth, irrespective of the reasons for so doing, that his (M. Prier's) record of an actual non-stop flight between London and Paris still holds good; and, of course, as a matter of fact, this is so.

M. Salmet's performance is, nevertheless, of no less merit for this slight halt by the way. Rather the contrary, as it goes to emphasise the main object with which he undertook the journey, viz., to demonstrate the practicability of the aeroplane in daily life. M. Salmet's intention was to fly to Paris and back to London in the day, not bothering as to the journeys being non-stop or otherwise. If each trip was unbroken incidentally, so much the better. Undoubtedly his flight was a remarkable one, as the machine was his own, and he had no assistance from any mechanic. He just looked after the machine himself, he took without hesitancy the longest cross-Channel route, and when he was uncertain of his way he just came down without fuss, had his breakfast, and then proceeded to his destination without the suspicion of a hitch, even then bettering the record non-stop time by about forty minutes, a performance which will no doubt be badly beaten in time; but still, as things stand—well, let the next best man go along and do better.

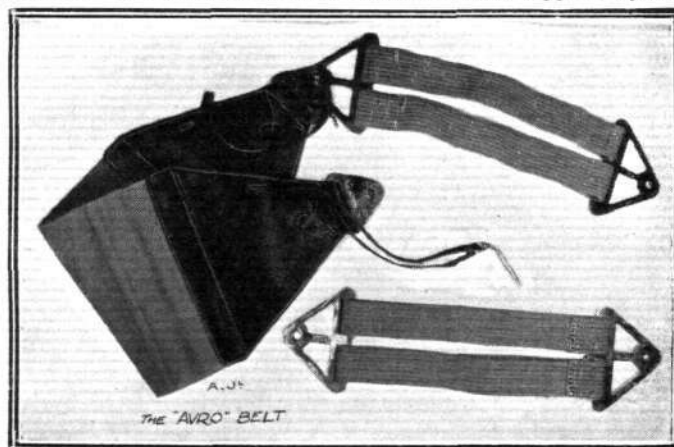
Another point raised by M. Prier in his letter to us is that M. Salmet started from Hendon earlier than the time publicly given. In this M. Prier is mistaken. A staff representative of FLIGHT who was on the ground at the start, timed his moment of getting away, and that time was 7.41 a.m. exact.

Whether M. Salmet will presently have a second try to do the

double journey in the day or not, is a matter for the future. But one thing we feel sure, in the event of his success, and should the trips be also non-stop flights, nobody would give him heartier congratulations than M. Pierre Prier himself, whose pupil, it will be remembered, M. Salmet was.

THE AVRO SAFETY BELT.

KNOWING, as they undoubtedly do, the demands of the aviator, Messrs. A. V. Roe and Co. have lately produced a type of safety belt which should have considerable vogue among flying men. From our photograph a good idea of this article can be obtained. The girdle is very wide, a good feature, and made from strong webbing. It is readily detachable from its elastic supports by the



The "Avro" safety belt.

mere withdrawal of either of a pair of pins that link the two sections together. The releasing device is so eminently simple and practicable that there can be no fear of it binding in use. That the belt may be released on both sides is a further wise precaution.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Committee Meeting.

A MEETING of the Committee was held on Tuesday, the 19th inst., when there were present:—Mr. R. W. Wallace, K.C., in the Chair, Mr. Griffith Brewer, Mr. Ernest C. Bucknall, Col. H. C. L. Holden, C.B., R.A., F.R.S., Prof. A. K. Huntington, Mr. F. K. McClean, Mr. Mervyn O'Gorman, Mr. C. F. Pollock, and Harold E. Perrin, Secretary.

New Members.—The following new members were elected:—C. L. Embiricos and Lieut. Henry Crossley Fielding.

Aviator's Certificate.—The following Aviator's Certificate was granted:—

198. George Prensliel, (Blériot, Hendon). Subject to permission of German Aero Club.

Competition Rules.—The Competition Rules of the Royal Aero Club, as drafted by the Competitions Committee, were finally approved.

A unanimous vote of thanks was passed to the Competitions Committee for its work in drawing up these rules.

Federation Conference.—The Chairman reported to the Committee the proceedings at the Conference of the Fédération Aéronautique Internationale held in Paris on the 15th and 16th instant.

The Conference considered the proposed new International Rules of the Fédération, which are to be confirmed at the Vienna Conference in June next. The suggestion of the Royal Aero Club that aviators' certificates should be issued in respect of flights made on hydro-aeroplanes under the existing rules was adopted, pending special regulations to be approved at the Vienna Conference in June next.

A unanimous vote of thanks was accorded to Mr. R. W. Wallace, K.C., and Mr. M. O'Gorman, who attended the Conference on behalf of the Royal Aero Club.

Royal Burgee.—A letter has been received from the Home Office intimating that His Majesty the King has been graciously pleased to grant permission to the members of the Royal Aero Club to fly on their aircraft a burgee bearing a representation of His Majesty, and surmounted by a Royal Crown.

A further announcement regarding the burgee will be made to the members shortly.

Regulations for Preventing Collisions in the Air.

The Royal Aero Club has drawn up the following regulations for preventing collisions in the air:—

Cross-Country Flying.—(a) Two aircraft meeting each other end on and thereby running the risk of a collision, must always steer to the right. They must, in addition to this, pass at a distance of at least 100 metres taken between their nearest adjacent points.

(b) Any aircraft overtaking another aircraft is responsible for keeping clear, and must not approach within 100 metres on the right or 300 metres on the left of the overtaken aircraft, and must not pass directly underneath or over such overtaken aircraft.

The distance shall be taken between the nearest adjacent points of the respective aircraft. In no case must the overtaking aircraft turn in across the bows of the other aircraft after passing it so as to foul it in any way.

(c) When any aircraft are approaching one another in cross directions, then the aircraft that sees another aircraft on its right-hand forward quadrant* must give way, and the other aircraft must keep on its course at the same level till both are well clear.

Exception.

In the case of dirigibles the distance of 100 metres prescribed above shall be increased to 500 metres.

Flying Grounds.—The following special regulations apply only to flying grounds:—

(d) Two aircraft meeting each other end on and thereby running the risk of a collision, must always steer to the right. They must, in addition to this, pass at a distance of at least 30 metres taken between their nearest adjacent points.

* From 0 degrees (i.e., straight ahead) to 90 degrees on the right hand constitutes the right-hand forward quadrant.

(e) Any aircraft overtaking another aircraft is responsible for keeping clear, and must pass outside the overtaken aircraft at least a clear 30 metres distance. In no case must the overtaking aircraft turn in across the bows of the other aircraft after passing it so as to foul it in any way. The distance shall be taken between the nearest adjacent points of the respective aircraft.

In these regulations the term "foul" shall include the giving of dangerous backdraught to another aircraft.

Presentation to Club.

Mr. Norman Clark Neill has kindly presented the Club with two framed announcements of balloon ascents from the old Vauxhall Gardens.

The British Empire Michelin Cup No. 1.

(Under the Competition Rules of the Royal Aero Club.)

The Michelin Tyre Company has presented to the Royal Aero Club of the United Kingdom, for competition by British aviators, a trophy of the total value of £500.

Annually, for five years, a replica of this trophy, together with a sum of £500 in cash, will be given to the successful competitor. This trophy will be competed for under the following conditions, which shall apply for this year only:—

CONDITIONS.

1. The winner for the year 1912 shall be the competitor who, on or before October 31st, 1912, shall have remained the longest time in the air on an aeroplane in one flight without touching the ground. The flights may only be made between the hours of sunrise and one hour after sunset, and in order to qualify for the prize the competitor must make a continuous flight of at least five hours.

2. Competitors may use any recognised flying ground in the British Isle, and all attempts must be made in the presence of the official or officials appointed by the Royal Aero Club.

3. Competitors desiring to leave the precincts of the flying ground during the flight must carry a barograph set and sealed by the officials prior to the start.

4. The time will be reckoned from the moment of crossing over the starting line in actual flight to the moment of alighting. The landing must be in sight of the official or officials.

5. The entrant, who must be the person operating the machine, must be a British subject, flying on a British-made aeroplane, must hold an Aviator's Certificate, and must be duly entered on the Competitor's Register of the Royal Aero Club.

6. The complete machine, and all its parts, must have been entirely constructed within the confines of the British Empire, but this provision shall not be held to apply to raw material.

7. An entrance fee of £1 must accompany every notification of an attempt, and at least three clear days' notice must be given to the Secretary, Royal Aero Club, 166, Piccadilly, London, W. A competitor must further deposit a sum of £10 on account of expenses, if any, of officials. Any balance not so expended will be returned to the competitor.

8. Should any questions arise at any time after the date of entry as to whether a competitor has properly filled the above conditions, or should any other question arise in relation to them, the decision of the Royal Aero Club shall be final and without appeal.

9. A competitor by entering waives any right of action against the Royal Aero Club or the Michelin Tyre Co. for any damages sustained by him in consequence of any act or omission on the part of the officials of the Royal Aero Club or the Michelin Tyre Co., or their representatives or servants, or any fellow competitor.

10. The aeroplane shall at all times be at the risk in all respects of the competitor, who shall be deemed by entry to agree to waive all claim for injury either to himself or his aeroplane, or his employees or workmen, and to assume all liability for damage to third parties or their property, and to indemnify the Royal Aero Club and the Michelin Tyre Co. in respect thereof.

11. The Royal Aero Club reserves itself the right to add to, amend, or omit any of these rules should it think fit.

166, Piccadilly.

HAROLD E. PERRIN, Secretary.

AIR EDDIES.

IN regard to the "Aeroplane" mystery, we have had a visit from a gentleman who informs us that he is the subject of our paragraph in last week's Eddies, wherein we referred to the mysterious aerial performance that took place in the neighbourhood of Tunbridge Wells recently. He confirms the story in its essential details, which are that he fell out of the machine after he had ascended and that the machine flew away on its own, and has not since been recovered, although a reward has been offered for information as to its whereabouts. More remarkable still, this flying machine has neither gas vessel nor wings and is *not* a helicopter. It contains an engine, and that is all we are at liberty to say at present, but the information that the inventor communicated to us in strict confidence is without question of the most startling character. Whether we shall be in a position to divulge further particulars or not it is impossible at the moment to say, because our informant tells us that the matter is just now in the hands of the Government and that his patent is likely to receive secret protection and, therefore, to be withheld from the usual channels of the Patent Office. Certainly, it is as well to have an open mind these days: and "wait and see."

I hear that the Avro works at Manchester are pushing well ahead with the three biplanes for which they have received orders from the War Office. These are to be much the same type as the new 60-h.p. E.N.V. model, which has shown itself excellent in its preliminary trials, under the direction of Lieut. Wilfred Parke, at Brooklands. It is tremendously fast; the average of the various speeds estimated by observers is somewhere near 66 miles an hour. The new military machines will be equipped with 50-h.p. Gnome engines.

Continuing their progression from triplane to biplane, the Avro firm have now nearly completed a monoplane. This new machine, about which much interest centres, will probably emerge from their works next week.

Quite a flying family are the Lewins, especially the younger representative of the family, officially known as Stanley Guy Lewin, called by the *Daily Mail* "the air-boy," and known locally at the aerodrome as "The Winkle." Grahame-White and this young enthusiast frequently take trips together. "Claude" turns round, and, finding the youngster always ready, says—"Come on, sportsman! Where shall we go?" And they fly off to find some new spot around Hendon. "Winkle" and his pilot are well portrayed in our photograph this week.

Next to the pleasure of having established such a good time record on his flight from London to Paris, Salmets chief delight is of

having "discovered" a hitherto little-known propeller, the Levasseur. Not only does it give him an increase of speed of some eight kiloms. an hour, but it never develops a flutter when the machine is turning, a failing to which many other types of propellers are prone. The blade resembles, more than anything, the blade of a scythe, cutting point first, and this fact earned for Salmets at the time when he was first testing it, the temporary pseudonym of the "chaff-cutter."

I understand that the Admiralty have placed with the British representatives of the Deperdussin firm an order for one of their new two-seater monoplanes. Mr. Lawrence Santoni is at the present time in Paris making arrangements for its delivery.

Mr. C. F. M. Chambers, who, it will be recalled, obtained his certificate on the Valkyrie monoplane, has now joined the Avro school as pilot instructor.

Gordon Bell is expecting to return to England from Buc early in April when, if he can get a "bus" in time, he will no doubt treat us, in connection with the new Brooklands competition, to some of the exploits he has been doing at the R.E.P. establishment for the past few months. The other day he made an exceptionally good flight, flying on the new 90-h.p. seven-cylinder two-seater R.E.P., with a passenger to the review at Vincennes. Returning to headquarters he flew over the centre of Paris, where he discovered that the *remous*, as he expressed it, "knocked spots off the renowned sewage farm *remous* at Brooklands."

Reports are floating round to the effect that the Wright Brothers are busy at their works at Dayton on a new biplane. Wings of Nieuport-type cross-section are, I believe, going to be used on this latest machine.

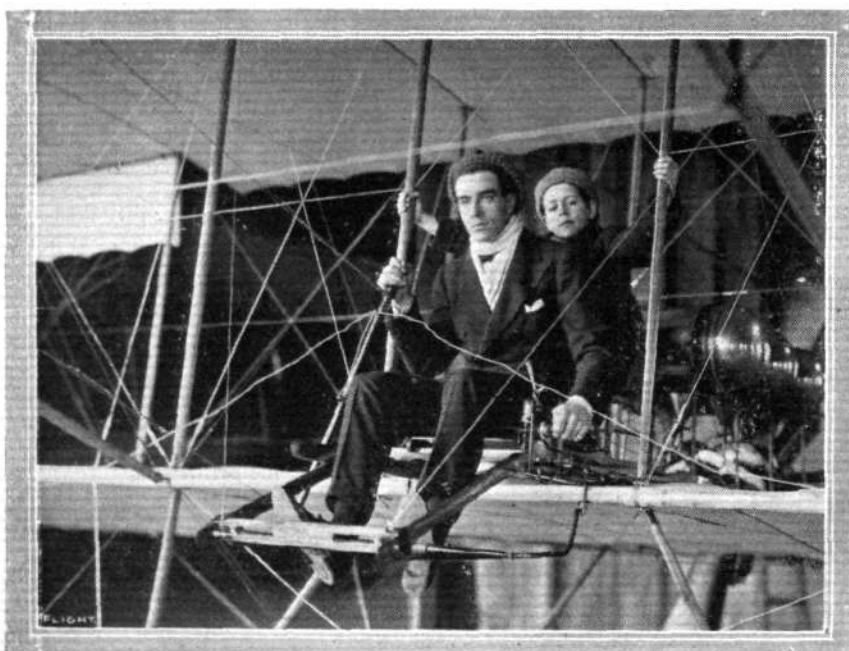
Practical experiments should soon be resumed on the portly Piggott monoplane, as the damage that the machine recently suffered has now been rectified. The landing chassis has been strengthened, and new shock absorbers fitted, for these were the source of its previous trouble, they breaking and letting the machine at a high speed down on to its skids, with a result that could only be expected. When Mr. Parr, who recently earned his ticket at the Blériot school, and who is responsible for its design, gets the machine to fly, it will undoubtedly be an exceptionally fast machine. An 80-h.p. Vivinus engine is installed.

A pleasing little ceremony happened on Tuesday evening last at the Aero Restaurant at Hendon when Salmets was presented with an aeroplane clock, a Thermos flask, and a muffler, all useful accessories for cross-country flying, by his colleagues at Hendon, in commemoration of his plucky Paris flight.

Hendon will soon have another Nieuport two-seater monoplane within its hangars, this making a total of three, one belonging to Mr. Robert Loraine, one belonging to Mr. Grahame-White, and the third, expected to arrive shortly, to the Ewen Flying School. This makes the third type of machine for instruction purposes at this school—its stable already includes Blériot and Deperdussin monoplanes—and on it Mr. Ewen will be enabled to give his pupils personal instructions whilst flying.

From Russia comes a whisper of wonderful results which are claimed to have been obtained with a new monoplane, which can be used equally well over land, water or snow. The propeller is also of special design, and although small, is said to be remarkably efficient. Another feature is an automatic parachute weighing 6½ kilogs., fitted over the pilot's seat. I understand that the machine has been built in St. Petersburg, under the surveillance of the authorities, who are not very keen on giving details.

"OISEAU BLEU."



Mr. Claude Grahame-White and a favourite passenger of his, Master S. Guy Lewin, another promising aviation son of Mr. F. Guy Lewin, so well known in the motor world.

FROM THE BRITISH FLYING GROUNDS.

Brooklands Aerodrome.

ON Wednesday of last week Pizey went up in Bristol No. 7 to try the air. Nesham then took over the machine and made very good flights being in the air 20 minutes in a gusty wind; unfortunately, when landing, he broke an undercarriage strut, this being the first piece of wood broken on the machine, which has a record of passing 12 pupils. Sabelli was out for a circuit on Dep. machine; afterwards Chinery took over the machine and made four straight flights.

On Thursday Fleming was out trying the air, but found wind too gusty for further flight. Chinery was at work on Deperdussin *brevet* making good straight flights and also a turn. Petre then took over machine and made a circuit.

The new Avro military machine with 60 E.N.V. was out for first time, Lieut. Parke piloting; he intended rolling the machine only, but it got off the ground while throttled down. The machine was out again in the afternoon, making straights in gusty wind. It appears to handle perfectly, and is very fast, Parke reporting that it has a big reserve of power.

Friday, Pizey and Merriam were early testing new biplane after various adjustments. Petre made one circuit on racing Deperdussin. Raynham took up Young for several flights on the Burgess-Wright. Kemp was also doing circuits on the Flanders, and Manning made straight flights and part of a turn. Late in evening Nesham made a fine solo flight in a gusty wind. Pizey on the monoplane indulged in a few circuits.

Saturday morning conditions were ideal for flying; Pizey was out first with Merriam as passenger. Fleming then took Major Bannerman for tuition flight and landing practice. Pizey made several circuits on monoplane.

Raynham piloted the Burgess-Wright for solo and gave a good exhibition of sharp turns and banking; afterwards carrying Young as passenger to get used to the controls. Chinery on the *brevet* machine for twenty minutes making straight flights and one circuit. Gill then on the same machine made straights and a half turn. Major Bannerman on the Bristol biplane made some straight flights, the engine

back-fired igniting petrol on the plane, which Major Bannerman did not notice but walked up to Merriam who was coming to start him up, which unfortunately gave the fire time to get a good grip. Eventually it was extinguished with some trouble and the aid of the pilot's coats. Petre and Sabelli respectively took the racing Deperdussin for several circuits to test new propeller. Kemp was doing circuits on the Flanders. Furbank then took the machine over and made several straight flights, unfortunately ending in a bad landing. The machine bounced back into the air. He then switched on, and the machine came down on skid, pitching the pilot out on his head. He was picked up unconscious, but fortunately no limbs were broken. Considering the nature of the smash, the machine stood up well, the undercarriage sustaining no damage whatever.

Sunday, weather conditions were too bad for flying.

Pizey, on Monday, was out early making circuits on new Bristol biplane. Raynham took up Young, the latter taking complete control for the first time. Petre and Sabelli did one circuit each on Deperdussin *brevet* machine.

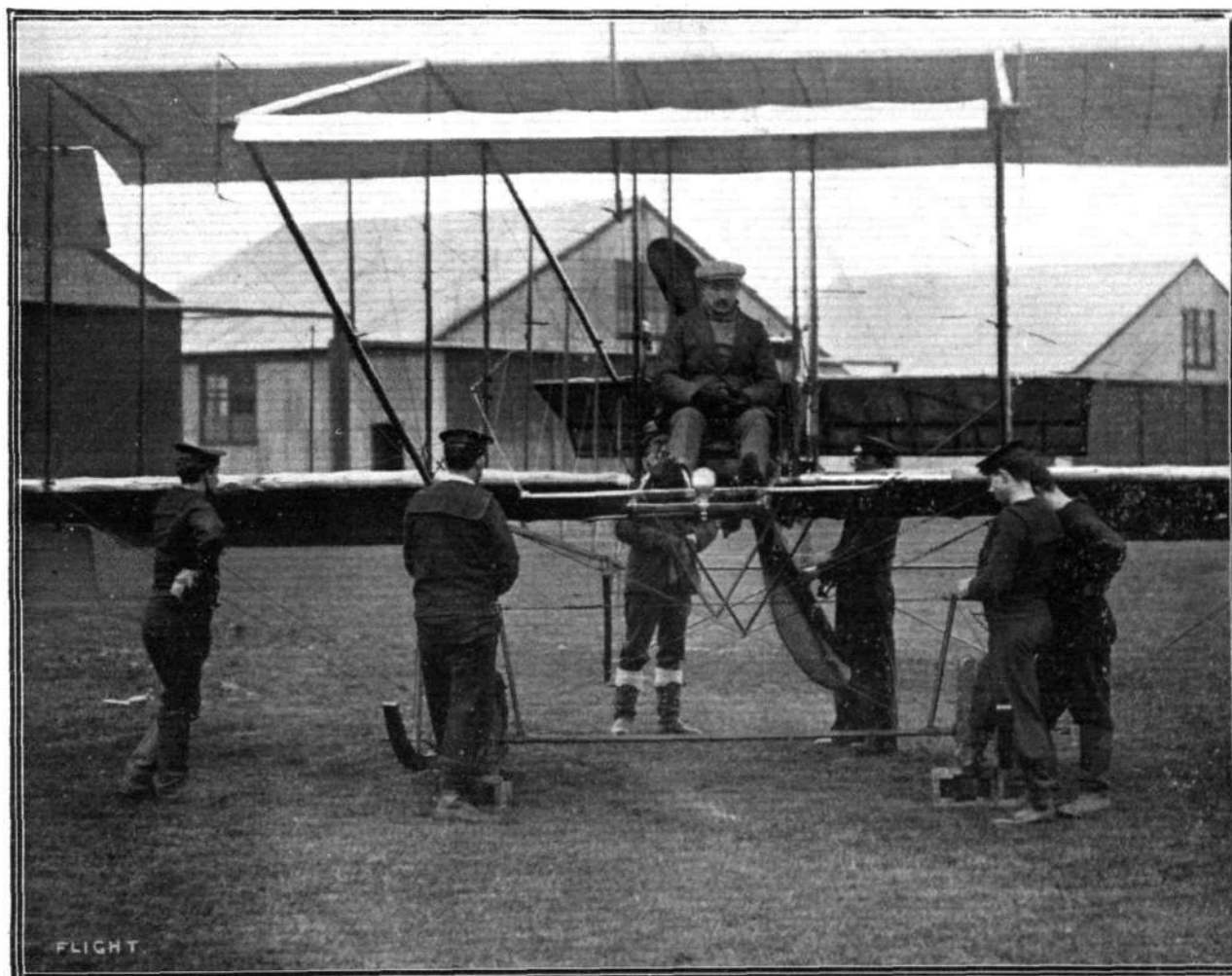
In the afternoon, the military-type Avro was making half-turns right and left; owing to following wind, Lieut. Parke underestimated the distance required for pulling-up, and hit the fence at the Byfleet end, resulting in a damaged propeller only. Sabelli did one circuit, Gill put in some straight flights, and Lane was rolling on Bristol monoplane.

Vickers No. 3 was out, after having new wings fitted. Macdonald, with passenger, took the machine for straight flights; but the machine did not appear to rise readily, but when it had just got away it came down again on one wing and turned turtle, pilot and passenger escaping with a few bruises.

In the early morning of Tuesday Chinery did one circuit on Deperdussin *brevet*, this being the only flight of the day, owing to bad conditions.

Liverpool Aviation School, Sandheys Avenue, Waterloo.

ON Thursday, the 14th, Mr. Melly took out the Blériot-Anzani and went for a short flight, but on his return a serious knocking



Capt. Gerrard on his Short biplane at Eastchurch, where he is one of the foremost competitors for the Mortimer Singer Aviation Prize for Naval and Military Officers.

developed and before he was able to effect a landing No. 3 piston broke wrecking its cylinder. Melly planed down neatly and effected a clean landing. The cause of the accident was a broken gudgeon-pin.

On Monday, the 18th, Melly had out the two-seater and flew two miles northwards with Hardman (his pupil) as passenger; on the return journey the wind freshened and rain began to fall which terminated flying for the day.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—A fine day on Tuesday when a good deal of flying was possible. Mr Lewis Turner opened on Monoplane No. 4 doing straight flights for the instruction of Mr. Ramsay, who followed with some rolling and a short straight. Meanwhile Mr. Biard was out on Biplane No. 3 making straight flights and circuits, as also was Major Liles. Mr. Manton and Mr. Raphaite were rolling on the same machine, but during the latter's practice, however, internal engine trouble developed and the machine had to be abandoned on the far side of the ground, but was towed home later by Mr. Lewis Turner on Biplane No. 2. During the afternoon Mr. T. O. M. Sopwith visited the school and flew several circuits on the old School 'bus afterwards taking up Carr as passenger and going to the assistance of Mr. Raphaite previous to the latter's machine being towed home. Mr. Fowler was also out on Biplane No. 2 making circuits at a height of 600 ft. and flying well, followed by Mr. Biard on same machine and then Mr. Lewis Turner, flew several circuits first with Mr. Fowler as passenger and afterwards with Mr. Ramsay.

Mr. Grahame-White on Wednesday was on the new biplane for test after alterations to the ailerons, which were found inefficient on first trial. They still, however, needed further adjustment, and the machine was sent back to the works for the necessary changes.

Climatic conditions were unfavourable for outdoor work Thursday and Friday, and pupils were busy in workshops.

Mr. Lewis Turner, on Biplane No. 2, was out on Saturday in the morning, although the wind was rather gusty, and flying not too pleasant. Mr. Grahame-White took a turn on the same machine in the afternoon, giving some fine exhibition flying, followed by Mr. Lewis Turner, who flew several circuits, but much work was not possible owing to increasing wind.

Blériot School.—Messrs. Pothet and Clappen, on Monday last week, each put in a good practice, consisting of three straight lines each. Mr. Prensier, who obtained his certificate in fine style on the

preceding Thursday, came down to the ground, but did not indulge in any further practice.

Tuesday was an excellent day for school work, and the pupils turned out in full force, Messrs. Morris, Hall, Pothet, and Clappen putting in a total of 25 rolls across the ground, and occasionally doing short hops.

Next day Messrs. Pothet and Clappen, who are working very keenly and never losing an opportunity for practising, each took it in turn to do straights for as long a time as the weather permitted.

Thursday and Friday weather was too bad for any school work outside the sheds.

Mr. Allen, who obtained his certificate at the Blériot School a little while back, on Saturday came down to the ground to inspect the trials of a 50-h.p. Gnome-Blériot which he has ordered, and at about five o'clock in the afternoon, the machine having been duly assembled, M. Salmel, the chief instructor of the school, and hero of the London-Paris-London flight the preceding week, took the machine out for its trials, doing three or four circuits in the clockwise direction, which M. Salmel appears to favour in preference to the usual left-hand method. The speed of the wind at the time being about 20 miles per hour, no school work was possible.

W. H. Ewen School.—Owing to the unfavourable weather very little school practice has been got in during the past week. Mr. Apcar has now started his course, while several new pupils are expected shortly, for whom ample provision is being made by introducing new school machines.

Salisbury Plain.

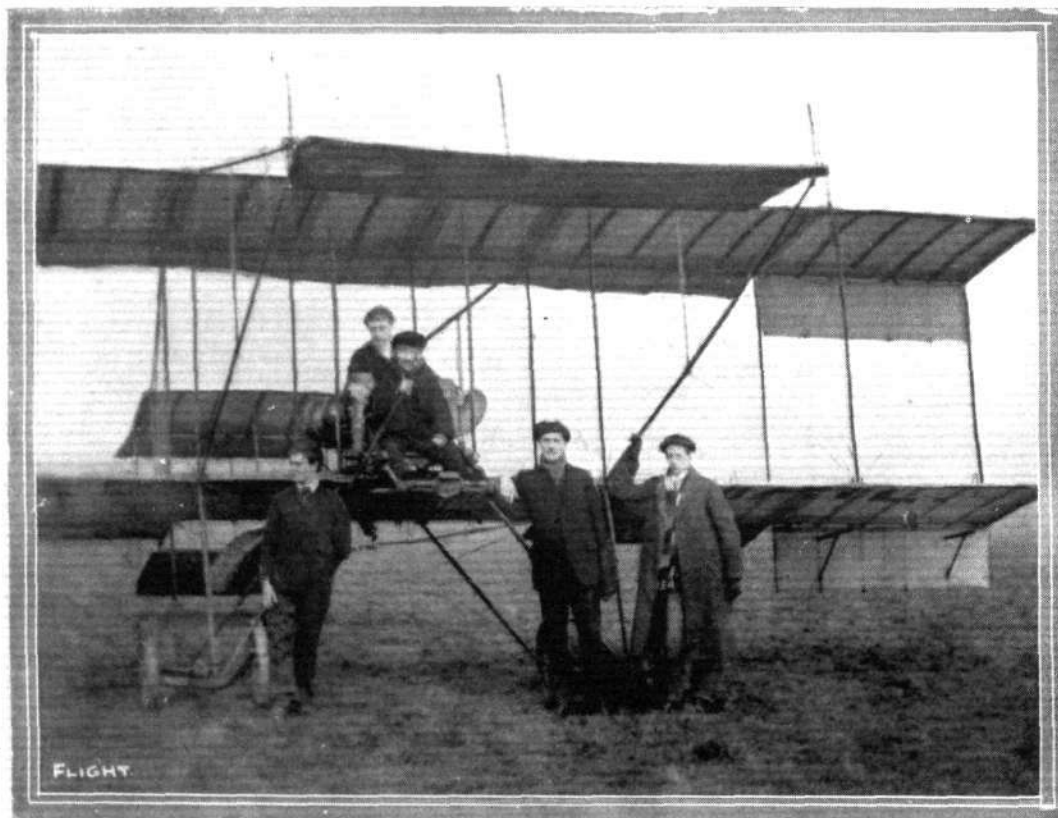
Air Battalion.—Wednesday and Thursday of last week were much too windy for outdoor work, but on Friday morning the wind moderated and Capt. Loraine was up on a biplane, and Lieut. Reynolds put in some useful scouting practice at a height of about 300 feet. He found the wind was rather treacherous, and soon afterwards it became so boisterous as to put an end to flying for the day. On Saturday morning Capt. Loraine was practising high flying on "F. 4," and after going up to 2,000 feet made a short cross-country trip. Lieut. Conner gave a fine exhibition of turning on "F. 5." Lieut. Reynolds was out on his monoplane, a two-seater "B. 6," and rose very rapidly to a height of 500 feet. The machine flew very steadily, although it passed through a number of unpleasant *remous*. On Sunday the weather was too bad for air work, and similar conditions reigned on Monday and Tuesday.

Bristol School.—Good work has been done during the fine intervals last week at the Bristol School, all the pupils taking part. Tuesday morning saw Jullerot out testing the conditions, followed by Gordon England, after which the Bristol staff of instructors were giving tuition flights, no solo flying, however, being done.

The wind was rather strong Wednesday morning, and a fog hung about, yet in spite of this no fewer than 32 flights were made at the Bristol School. Gordon England put in seven flights with pupils as passengers, and Bendall and Harrison also gave five tuition flights each. Commander Schwann started up for a solo and gave a really fine exhibition, afterwards ascending for two more trips, making good landings each time. Lieut. Brodigan was also out performing in a clever manner, flying for three successive solos. Lieut. Wyness Stuart is getting on remarkably well with the monoplane, and was out for some practice flights.

A strong wind was blowing Thursday when Jullerot and Gordon England set out to test the weather. Tuition work, however, was proceeded with Lieuts. Fielding and Ercole being passengers, Jullerot afterwards ascending with Capt. Campania.

Wind and rain prevented



THE GRAHAME-WHITE SCHOOL AT HENDON.—Photograph of five members of the Grahame-White establishment at work on Monday morning last. In the pilot's seat Mr. Lewis Turner, with Mr. Ramsay seated behind him. Standing, from left to right, Messrs. Manton, Fowler and Biard.

any attempt at out door work all Friday, and instruction had, therefore, to be confined to the hangars.

Saturday morning was fine, although somewhat dull, and Gordon England was out early making a flight, Lieut. Ercole accompanying him. England afterwards went with Lieut. Hall, who has just recently joined the school, and Jullerot was out with Lieut. Marshall, another new pupil. Bendall took Lieut. Fielding for a trip, and Prier went for a spin on the Bristol monoplane, Lieut. Antoni being passenger. He quickly rose to fully 2,000 ft., and showed a fine turn of speed.

In the afternoon the wind had risen somewhat, but after

Hotchkiss had made a circuit, school work was restarted by Jullerot giving tuition flights, whilst Commander Schwann made two solos also did Lieut. Brodigan, Lieut. Wyness Stuart making one flight. Lieut. Head, who just recently took his *brevet* at the school on the biplane, and is now undergoing a course on the monoplane, was out for two solos. Lieut. Bower was also up for a spin, and Gordon England was up giving tuition flights. Prier carried out a good flight on the monoplane, making several circuits, and attaining a high altitude.

Terrific wind and rain put all thought of flying entirely out of the question both on Sunday and Monday.

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AERONAUTICAL SOCIETY OF GREAT BRITAIN.

OFFICIAL NOTICES AS SUPPLIED BY THE SECRETARY.

Annual General Meeting.—The annual general meeting of the Aeronautical Society will be held on Wednesday, March 27th, 1912, at 8.30 p.m., at the Royal United Service Institution, Whitehall, S.W.

Mr. Handley Page will give a resumé of Eiffel's work as described in the latest edition of his book, "La Resistance de l'Air," after the general meeting. A discussion will follow.

Members are reminded that their ballot papers must be returned to the Secretary before 12 noon, on Tuesday the 26th inst.

Attendances of the Council.—The attendances of members of the Council, out of a total of 16 Council meetings, have been as follows:—

A. E. Berriman, 16; Griffith Brewer, 8; Capt. A. D. Carden, R.E., 9; T. W. K. Clarke, 15; B. G. Cooper, 16; J. W. Dunne, 8; John Dunville, 0; J. H. Ledebuer, 11; Capt. E. M. Maitland, 4; F. K. McClean, 7; Lord Montagu of Beaulieu, 0; Alec Ogilvie, 8; Mervyn O'Gorman, 10; F. Handley Page, 9; Col. H. E. Rawson, C.B., R.E., 4; Col. F. G. Stone, R.A., 2.

Council Meeting.—A meeting of the Council was held on Wednesday, March 13th, when there were present:—Mr. A. E. Berriman (in the Chair), Mr. Griffith Brewer, Mr. B. G. Cooper, Mr. J. H. Ledebuer, Mr. Mervyn O'Gorman, Col. H. E. Rawson, and Mr. B. Woodward (Hon. Solicitor).

Appointment of Committees.—The following committees have been appointed:—Inventions Committee (which deals with inventions submitted for the Society's opinion), Mr. T. W. K. Clarke and Mr. B. G. Cooper; Library Committee (which has charge of the Society's Library and records), Mr. H. F. Lloyd and Mr. Harry Turrill; Publications Committee (which controls and organises the

Society's Publications), Mr. A. E. Berriman, Mr. B. G. Cooper, and Mr. J. H. Ledebuer; Relations Committee (which treats, when occasion arises, with other aeronautical bodies), Mr. A. E. Berriman, Mr. B. G. Cooper, Mr. F. Handley Page, and Major-General R. M. Ruck; representatives on the Royal Aero Club's Committee for the investigation of aeroplane accidents, Mr. A. E. Berriman, Mr. J. H. Ledebuer, and Mr. Mervyn O'Gorman; representatives on the Parliamentary Committee on Aeronautics, Lord Montagu of Beaulieu, Mr. Griffith Brewer, and Mr. J. W. Dunne; representative on H.M. War Office Technical Reserve Committee, Col. J. D. Fullerton, R.E.; Research Committee (which conducts the research work of the Society in all its branches).

The composition of the Research Committee will be announced next week.

Meetings.—A meeting of the Society will be held at the Royal Society of Arts, John Street, Adelphi, on Monday, April 15th, at 8.30 p.m., when Mr. T. W. K. Clarke will read a paper on "Automatic Stability."

Weekly meetings of an informal nature will be held at the Society's offices, 11, Adam Street, Adelphi, on Mondays from 5 p.m. Refreshments can be obtained and the Library and current periodicals will be available for reference as usual.

The next informal meeting will be held on Monday, March 25th, when the subject for discussion will be "The Atmospheric Conditions at Eastchurch Aerodrome."

Filcher Memorial Fund.—The Council beg to acknowledge the following subscriptions:—Amount previously acknowledged, £19 15s.; Major B. Baden-Powell, £1 1s., Col. H. E. Rawson, 10s.; W.H.A. 5s.

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WHO WAS THE FIRST MAN TO FLY?

THIS question has been put to us by a correspondent and like many a simple query it is something of a poser when it comes to making a straightforward reply. In 1893 Maxim's great aeroplane left the rails on which experiments were being made at Baldwin's Park and performed a short flight across the grounds with three men on board. The accidental nature of the occurrence, however, had led many students of aeronautical history to ignore this record.

In France, some little while ago, a great fuss was made to support the claims of Ader, who was supposed to have flown 50 metres in 1890 and 300 metres in 1897. More recently, however, statements have been made that cause Ader's light to burn less brilliantly.

There is, of course, no doubt about the official claim of Santos Dumont, who made the first public and officially observed flight on October 23rd, 1906, whereby he won the Archdeacon cup for a flight exceeding 25 metres.

But, although they have no official record to back them, the Wright brothers, it seems to us, have the best claim to be regarded as the first men to fly, for they attained success in 1903 and before the end of 1904 had achieved a relatively complete mastery of the art. At any rate they were then making flights exceeding 20 miles in length, while nobody else in the world could do more than jump. It was not until January, 1908, that Henry Farman won the Deutsch-

Archdeacon prize for the first circular kilometre. When Wilbur Wright at last came to France he demonstrated his skill in the eyes of the world, and as it was well known that he had not been flying for a long time previously, there is no reason to doubt what the Wright brothers themselves have as a matter of fact stated, that they learned to fly and won success in the years above mentioned.

It seems to us no more than simple justice that the Wright brothers should have their names definitely associated with the first flight, because nothing that the world is likely to do will ever give them more credit than is their due for the perseverance and sound methods by which they attained their end. It is all very well to refer to such facts as the Maxim, Ader, and Santos Dumont jumps, but surely no serious student of aeronautics can fail to appreciate the fact that by 1892 Lilienthal had already demonstrated by his gliding experiments that the real problem of flight was equilibrium and not merely support. In demonstrating that a steam-driven aeroplane could be made to lift itself off the ground, Maxim showed that so much was possible but he did not prove more than this, and in the light of Lilienthal's work the world was really not much wiser for anything that was subsequently accomplished in aviation until Farman had flown his circular kilometre and the Wrights had publicly demonstrated the real art.

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The Disecration of Windermere!

THE aesthetic objectors to the use of Windermere as the locale of hydroplane experiments seem to have received scant satisfaction at the hands of Mr. Ellis Griffith, who received a deputation of the outraged ones on behalf of the Home Office. He was asked to exercise the powers conferred by the Aerial Navigation Act and to prohibit flying over the lake. In reply he pointed out that as the dangers which the deputation had emphasised were mainly of a contingent and problematical nature, the authorities did not see their

way to enforce prohibition. However, they thought that it was a case where regulations might very well be laid down, and they proposed that if there was an aviation school there the hours should be limited from four or five until seven or half-past in the morning, so far as the instruction of pupils was concerned. Mr. Ellis Griffith also informed the deputation that the Home Office had no jurisdiction over hydro-aeroplanes while they were afloat. They were the concern of the Board of Trade until such time as they left the water and rose into the air.

Which is more than a little Gilbertian.

BRITISH NOTES OF THE WEEK.



The new medal of the Royal Aero Club.

A Burgee for the Royal Aero Club.

THROUGH the Home Secretary, His Majesty the King has expressed his approval of a burgee which may be flown by members of the Royal Aero Club on their aerial craft. The letter from the Home Office describes the burgee as bearing a representation of His Majesty surmounted by a royal crown.

Another Flying Ground in the Midlands.

ARRANGEMENTS have now been completed by the Midland Aero Club for the use of the Castle Bromwich Playing Fields as a flying ground, and the club is installing a glider and a mechanical teacher for the use of members. The ground is conveniently situated, being only six miles from Birmingham by road, while there is a good service of trains to Castle Bromwich Station which adjoins the ground.

A National Movement in Germany.

INSPIRED no doubt by the National Fund movement in France, an endeavour is being made to launch a similar project in Germany. At Heidelberg a sum of £500 has been raised towards the purchase of an Army aeroplane and there is every prospect of the remaining £500 being forthcoming very shortly. The Essen electrical works have presented £5,000 to the German War Office for the furtherance of military aeronautics, and the Essen Municipal Council has voted a similar sum for the laying out of a flying ground at Gelsenkirchen.

The First Breguet Pilot in England.

A CORRESPONDENT from Farnboro' writes us in regard to the query last week as to Lieut. Hynes being the first Englishman to fly a Breguet machine in this country. "I think," our correspondent says, "it is only fair to Mr. G. de Havilland to mention that it was he and not the former who had that privilege. I had the pleasure of witnessing the flights, so can vouch for their authenticity."

Mother Ship for British Naval Aeroplanes.

It is understood that, largely as the result of Commander Samson's successful flight from the deck of H.M.S. "Africa" at Sheerness, there is a strong probability that one of the older type of cruisers will be adapted as a mother ship for aeroplanes, and fitted up to carry a number of flying machines.

Australia and Aviation.

THE Australian Government seem to have difficulty in finding either pilots or machines to meet their requirements, and it is now announced that they have postponed the selection until after the Army trials. It is not easy to understand what the difficulty is, as we believe quite a number of qualified pilots applied for the position.

N. Africa, not N. America.

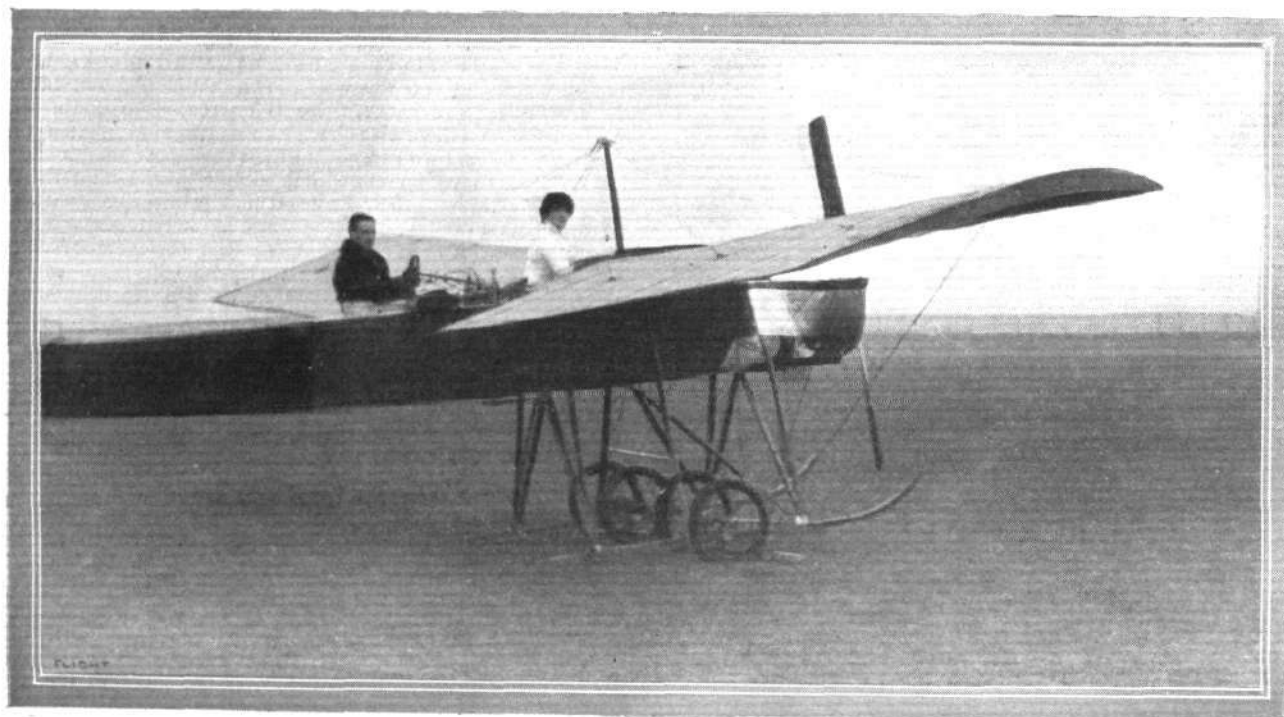
By a printer's error last week in the British and Colonial Aeroplane Co., Ltd., advertisement, it was stated that three types of Bristol machines were adopted, after a series of test flights, for use in the war in North America. Obviously this should have been N. Africa.

A Quick-Firer for Aeroplanes and Airships.

AT Messrs. Vickers' works at Erith a new quick-firing gun has been evolved mainly for use on air-craft. The new weapon has been undergoing tests at the firm's range at Eskmeals, on the Cumberland coast, and is said to have given very good results.

A Women's Society in New York.

NEW YORK boasts an Aeronautical Society of Women, which meets twice a month, one meeting being of a social character, while the other is devoted to the practical study of aeronautics. At the meeting on February 29th, for instance, addresses were given by Mr. Wilbur R. Kimball on his cross-country flights from Long Island to New Jersey, by Mr. A. Leo Stevens on his ballooning experiences, by Mr. T. Emerson on the recent Paris Show, and by Mr. Carlos de Zafra on the progress of aeronautics.



TO FLY THE CHANNEL.—Lieut. Lawrence in the pilot's seat of his Blackburn monoplane with Mrs. Leeming, who will accompany him as passenger when he makes his trip across the Channel as referred to in FLIGHT recently.

FOREIGN AVIATION NEWS.

Cross-Country Flight with a Lady.

ON his Borel machine on the 12th inst., Verrept flew back from Rheims to La Vidamée, covering the 120 kiloms. through wind and rain in 1 hour 5 mins. He was accompanied by Mrs. Mattis.

Gibert Proposes a Long Trip.

By the aid of a motor car Gibert has been touring over a route from Chalons-sur-Marne to Nice, *via* Chalons-sur-Saone, Macon, Lyons and Marseilles, which he proposes to follow shortly in his Borel machine. Should he succeed in getting to Nice he intends to then fly across to Corsica.

Flying Across Country over Four Hours with Passenger.

A FINE performance was put up at the Blériot military school at Etampes on the 16th inst. by Lieut. Sylvestre. Accompanied by his mechanic he flew from Etampes to Sezanne (Marne) and back being aloft for 4 hrs. 12 mins. and covering 300 kiloms. in that time without a descent.

A Good First Trip.

MOUNTING a Blériot-Gnome monoplane for the first time on the 12th inst., Lieut. Francescon had no difficulty in completing his first cross-country flight for his superior *brevet*, over the course from Etampes to Beaugency and back.

Flying to Golf.

ACCEPTING the invitation of some English friends, Lieut. de Malherbe on his Blériot and Lieut. Montjoue on his Nieuport flew from the flying ground at Pau to the golf links. After playing a round and having some refreshment they remounted their machines and returned to their headquarters.

To Help on the Cause.

LEAVING the Deperdussin ground at Amberieu, on the 12th inst., Vidart flew over Lyons, and landed at the Bron aerodrome. Subsequently he returned to his headquarters, and when passing over Lyons dropped a shower of paper roses, each of which bore the reminder, "Donnez votre obole pour les avions!" On Sunday he flew over Bourge and dropped a similar shower.

Nearly Two Hours on a Caudron.

ON the 12th inst., Lieut. Bon was flying on a Caudron biplane for an hour and fifty minutes over the country round Le Crotoy. The same day Sapper Jacquemart, also on a Caudron, flew over the circuit Le Crotoy-Rue-Arry. Rene Caudron made some tests with his hydro-aeroplane also went to Arry and back on his machine.

Hanouille at St. Raphael.

SOME very good flights were made at St. Raphael last week by Hanouille on his Blériot-Anzani. On the 12th inst. he flew to Valescure and Frejus and back, and made a long trip with his wife. He again went to Frejus on the following day, turned above the cathedral and won the Prix des Hoteliers. He piloted his machine round the Cap d'Antibes, on the 14th inst., when Vallet, also on a Blériot, after giving some exhibition *vol planés* was obliged to suddenly land on the sea shore.

Doings at Hanriot School.

ON the 12th inst., Marcel Hanriot was flying over Rheims for an hour at a height of 1,500 metres. Two days later he paid a visit to Chalons, using his new machine, which attains a speed of 140 k.p.h. It is fitted with brakes by the aid of which it can be pulled up in 15 metres. On the 17th inst. he flew above Rheims Cathedral at a height of 1,800 metres.

M. Farman Flies to Chartres for Dinner.

ACCOMPANIED by Senocque, M. Maurice Farman, on Sunday, flew from Buc to Chartres, and after taking lunch, made a call at Etampes to see some tests made with a new machine by Chevillard. He afterwards returned to Buc. The Vicomte de Paris was given his aerial baptism on the 12th, by M. Farman, at Buc.

A New Sommer Superior Pilot.

ON his Sommer monoplane, on the 14th inst., at Mourmelon, Lieut. Bosquet passed the last two tests for his military certificate. Lieut. de Clerk meanwhile made a 35-minute flight and four monoplane were put through their official tests by Bathiat before being handed over to the army.

Good Work at Blériot Military School at Pau.

ON the 14th inst., Lieut. Adam Gironne, who only joined the school on February 20th, qualified for his *brevet*, and Cavalry-Sergeant Laurent was in the air for an hour and a half, sometimes being at a height of over 1,500 metres.

Long Flights on Farman Machines.

ON the 14th inst., Lieut. Mouger Devarenne was flying for two hours over the country round about the Buc Aerodrome on a Farman biplane, and Lieut. Pierrat on a Henry Farman machine returned from Buc to Rheims. Two days later he paid a visit to Laon in order to visit proposed aviation grounds. After his inspection he remounted his machine, and flew back to Rheims.

Morin in the Sea.

AT the Battle of Flowers on the 14th inst. at Nice, the three aviators at the California Aerodrome, Laurens on his Deperdussin, Poumet on his Borel, and Morin on his Blériot each flew over the crowds, dropping bunches of flowers. Each was accompanied by a passenger, Laurens taking his wife. Morin ventured out over the sea and was forced to make an involuntary descent. Both the aviator and his companion managed to keep themselves afloat by hanging on to a wing until they were reached by fishermen.

Further Entries for the Peugeot Prize.

THE entry list for the Peugeot prize for a human flight of ten metres has now grown to 106, among the latest entries being another lady, Mdle. Renee Gentil, of Nice.

Three Fatal Accidents.

DURING last week, France, Germany, and Italy were the scenes of fatal accidents. While piloting a monoplane at Pau on the 13th inst., Lieut. H. P. Sevelle fell from a height of 750 ft., and died a few minutes afterwards. At Johannisthal, on the 15th, Witte on a biplane fell from a height of 150 ft., and was fatally injured. It is stated that the accident was caused through one of the propellers on his machine breaking. The third death was at Vizzo, near Milan, where Lieut. Bertolotti was killed through his machine capsizing while attempting a cross-country flight.

Three Hydro-Aeroplanes for Russia.

As a result of the report of their delegates, who have been watching the tests with a Curtiss "Triad" at Nice, the Russian Government have ordered three similar machines from Glenn Curtiss, and Lieut. Stackowski has been nominated to receive instruction from Mr. Hugh Robinson in the manipulation of these machines.

The New "Demontable" Henry Farman.

ON the 15th inst., a deputation of military officers visited Buoy to witness the experiments with a new military biplane specially designed by Mr. Henry Farman with a view to ease of dismounting for transport. The tests were made by Chevillard, who dismantled the machine in two minutes and had it ready for flight again in three minutes. This, perhaps, gives us an inkling of what we shall see in years to come at the Military Tournament.

A Runaway Aeroplane.

FOLLOWING the escapade of the British "mystery aeroplane," comes the news of a somewhat similar incident at Rheims on Wednesday of last week. A pupil named Bellot had started up his engine, but before he could get up to the pilot's seat the machine started away. It rose in the air, and after pursuing an indefinite course for about ten minutes landed on the top of one of the sheds, smashing itself and doing considerable damage to the hangar. Fortunately no one was hurt.

Vedrine's not Quite Successful.

ALTHOUGH the whirlwind campaign of Vedrine in his candidature for Limoux, in the French Chamber, did not secure his return, it was rather a surprise to old Parliamentary hands that the tempestuous aviator, with the sole aid of the Deperdussin monoplane and his intensely patriotic extempore speeches, should have succeeded in securing 6,927 votes against his opponent's 7,690. He stood as an independent socialist, with practically no programme, except to sit in the Chamber as a member for aviation. He flew from place to place in the 152 communes which make up the division, and wherever he stopped the machine was surrounded by a large crowd, and whenever he held a meeting in the same place as his opponent the latter wasted his persuasiveness upon the desert air.

Military Aviation in Belgium.

THE Belgian Military Authorities are asking for £93,600 for military aviation and the reorganisation proposals allow for twenty-four machines for the general army, six for the reserve, six for Antwerp, four for Leige, and four for Namur, as well as two dirigibles for the centre of the country. Eight officers have been nominated to receive instruction, and any other officers wishing to qualify for a *brevet*, will be allowed two months leave on full pay and be given an indemnity of £40 on their admission to the military school.

Mishaps in Germany.

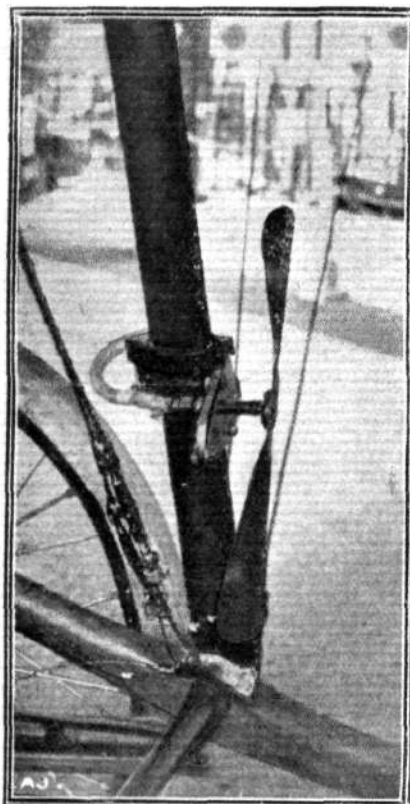
JOHANNISTHAL was the scene of a collision between two monoplanes on the 13th inst., one occupied by Schwandt and Badowski and the other by Rettinger. Both machines were badly smashed, but the only person to be hurt was Badowski who sustained injuries to his legs. On the previous day while flying from Johannisthal to Doeberitz, Lieuts. Engwer and Solnitz found the engine of their machine running badly and decided to come down to examine it. The machine, however, made a bad landing on some ploughed land, with the result that Engwer, the pilot was slightly injured, while his companion was rendered unconscious being severely hurt about the face through being thrown under the machine. The same day an accident occurred at Teltow where Stein while testing a monoplane of his own construction fell from a fair height and was badly injured.

Germany Going Ahead.

FROM Berlin we learn that no less than forty machines have been ordered by the German War Office from one firm alone, Messrs. Etrich of Trautenau, Bohemia.

Aviation in Bavarian Army.

THE Bavarian Minister of war, having already ordered a number of aeroplanes is now organising a company of aviators to comprise 70 officers and non-commissioned officers. The headquarters of the Company will be at Ober-Schleissheim, close to Munich, and operations will commence at the end of the month.



A propeller-driven petrol pump was a feature of one of the aeroplanes at the late Paris Show, *Automobil Welt* (January 7th), the object being to provide a constant pressure of petrol at the engine. We are doubtful, however, whether this object would be obtained by such means, as the speed of the pump would depend, not on the velocity of the aeroplane, but on that of the air relative to the direction of the path of the latter.

The Driout ornithopter is described and illustrated in the *Allgemeine Automobil Zeitung* (January 14th), Vienna edition. This apparatus is fitted with a three-cylinder

35-h.p. Viale engine which drives (through gearing) a two-throw crank-shaft, the connecting-rods of which are attached to the wing arms which move up and down at 55 seconds intervals. The writer points out that it is not so much due to the inherent disadvantages of the ornithopter as to the overwhelming success of the Wright aeroplanes that the former type of apparatus has not been further developed up to the present.

As analogous cases we may, perhaps, quote the ousting of the steam car by the rapid perfection of the petrol motor; the ignoring of the inventions of Atkinson, Brayton, Diesel and others by a public sufficiently satisfied with the efficiency and simplicity of the ordinary Beau de Rochas (or Otto) cycle; the obscuring of the question of the variable power transmission on motor cars by the crude simplicity and the simple crudeness of the sliding gear.

Gyroscopic action in flying machines is dealt with in a practical and non-mathematical article, by Herr G. Wichmann, in the Technical Supplement of *Automobil Welt* (January 12th). The gyroscope and its action, ranging from the child's toy to the Brennan monorail, has always been somewhat of a mystery to the non-technical public, and a *memoria technica* given by the author for

German Navy and Aeroplanes.

IT is announced that the German Naval Minister is desirous of organising a competition with a view to developing an aeroplane for the Navy. The machine must be capable of rising and alighting in rough seas without any external assistance, it must carry two passengers and be capable of flying against a 36-mile wind. The machine will also have to perform the usual rapid climbing test. A number of naval officers have already qualified as pilots, and a naval flying centre as Dantzig should be in full swing on April 1st. The machines which will be used have been fitted with floats pending the evolutions of the ideal navy aeroplane.

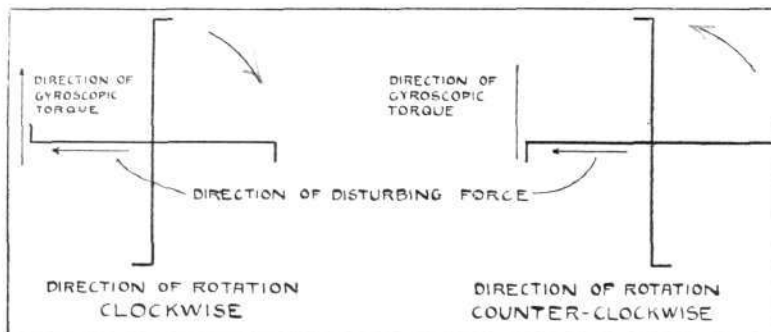
Aeroplanes at German Manœuvres.

SIX aeroplanes divided into two groups took part in the manœuvres at Doebritz, on March 15th, and rendered very considerable assistance. One of the pilots on a biplane ran short of petrol and had to land on the road, but replenishments were obtained by a cavalryman and the aviator was able to get away after a stop of 35 minutes.

The Gordon-Bennett Race.

THE Aero Club of America announces that it has received five challenges for the Gordon-Bennett Aviation Cup, viz: from Belgium, France, Holland, Switzerland and the United Kingdom. The race will take place in Chicago, and Great Britain will be represented by Mr. Claude Grahame-White and Mr. Gustav Hamel.

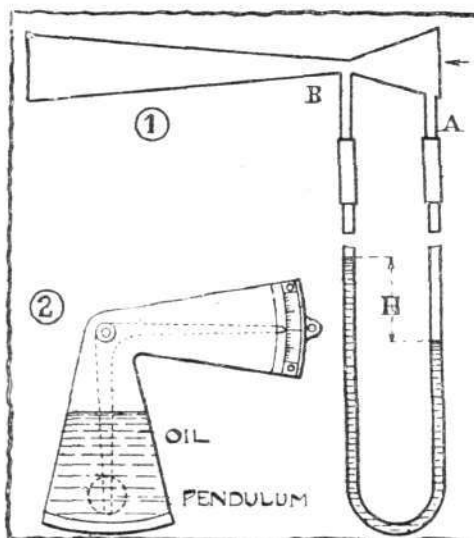
the rule that the gyroscopic couple acts about an axis at right angles to the precession, is sufficiently ingenious to warrant us in reproducing it herewith. Let the gyroscope rotate in the plane of the paper round an axis represented by the centre of a gammadion or swastika; let the disturbing force act along one of the arms, then



the gyroscopic torque will act in the direction in which the upper branch of the arm (bent in the direction of the rotation of the gyroscope) points.

An experimental aeroplane, its fittings and results obtained with it are described in *La Technique Aeronautique* (November 1st, 1911), by Captain Durand. This aeroplane is fitted with a dynamometer interposed between the engine and the frame, and which works a self-registering apparatus.

It is further equipped with an electric revolution counter, a venturi tube to measure the velocity of the aeroplane relatively to the wind, an inclinometer to measure the angle of the planes. The latter two fittings are reproduced herewith (from *Le Génie Civil*, January 6th, 1912). In Fig. 1, B H A is a motor manometer to indicate the difference in pressure between the mouth and the throat of the venturi tube. Fig. 2 illustrates the inclinometer, the weighted pendulum of which is damped by an oil bath.



Models

Conducted by V. E. JOHNSON, M.A.

Models and Practical Research Work.

A CORRESPONDENT (Mr. Bertram Lewis) writes asking if it is not possible to use the model in the way of practical research work much more than is being done at present, and if it is not the duty of the model clubs to foster this view of it and to abandon—except for the junior portion—its more toy-like aspect? Our correspondent then proceeds to propose a practical scheme, which we shall have much pleasure in publishing later on. Just at the present time the majority of clubs are fully occupied in arranging their competition programmes, &c., for the coming season, and it is practically too late for them to alter them in the manner suggested by Mr. Lewis—whose scheme, by the way, contains many excellent points. Moreover, some of the clubs, at any rate, are already endeavouring to arrange this season's competitions on a more scientific basis than those of last year, as will be apparent a little later on.

Model Valkyrie.

In reply to S. M. Gow's recent query C. C. Horner sends the following particulars and sketch:—"The model must be well-powered owing to its heavy type [this entirely depends how it is built] 300 ft. being about its limit. I do not advise the wheels [Messrs. J. Bonn and Co. have quite suitable very light aluminum wheels]. Materials, American whitewood, cut with a fretwork machine—two main spar $\frac{1}{4}$ in. \times $\frac{1}{4}$ in. or even rather less, the rest $\frac{1}{8}$ in. \times $\frac{1}{8}$ in. The elevators of piano wire, also the rudders, both being adjustable. Japanese silk can be used for covering the planes, &c., lightly varnished, also all the woodwork. Propellers cut from the solid, 8 ins. \times $1\frac{1}{2}$ ins. to $2\frac{1}{2}$ ins. All bracing done with strong white silk rubbed with wax [Japanese silk gut is preferable]. The main planes have a slight dihedral angle also a small camber."

Sunshine and Duration of Flight.

We have received the following communication from Mr. W. H. L. Baddeley on the above. "On Sunday morning, February 25th (a bright day with sunshine), my model flew well and high, the wind was slight; in the evening just after the sun had set, and little or no wind, and a slight mist; my experience was the same as Mr. L. Roche, the model making very low and short flights, coming down in some 50 yards with the rubber still wound, the model declining either to rise or make a *vol plane*. The model was in exactly the same condition as in the morning flights." [What about the rubber being fatigued? are we to understand it had the afternoon "off"?].

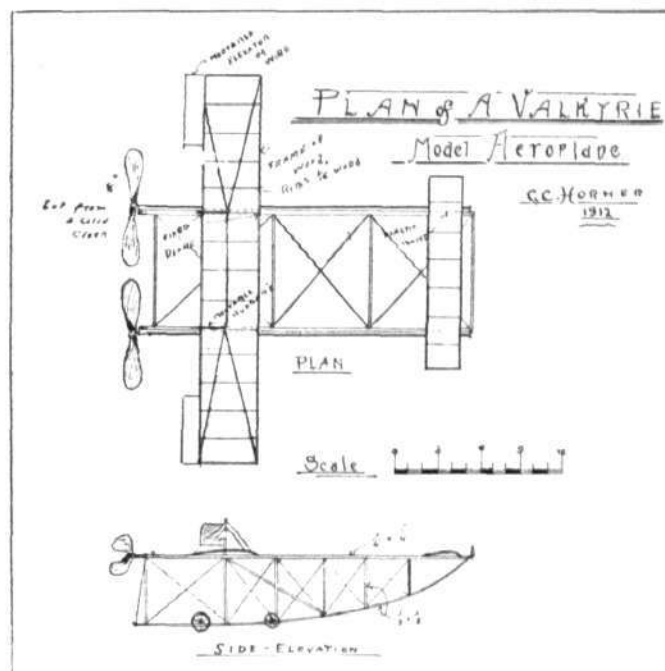
Quite a number of aero modelists, with whom we have conversed on the subject, all bear out Mr. Roche's original statement.

Inter-Club Contest.

We have already several letters to hand on this subject, but there are still a number of secretaries whose views we would like to have on the subject.

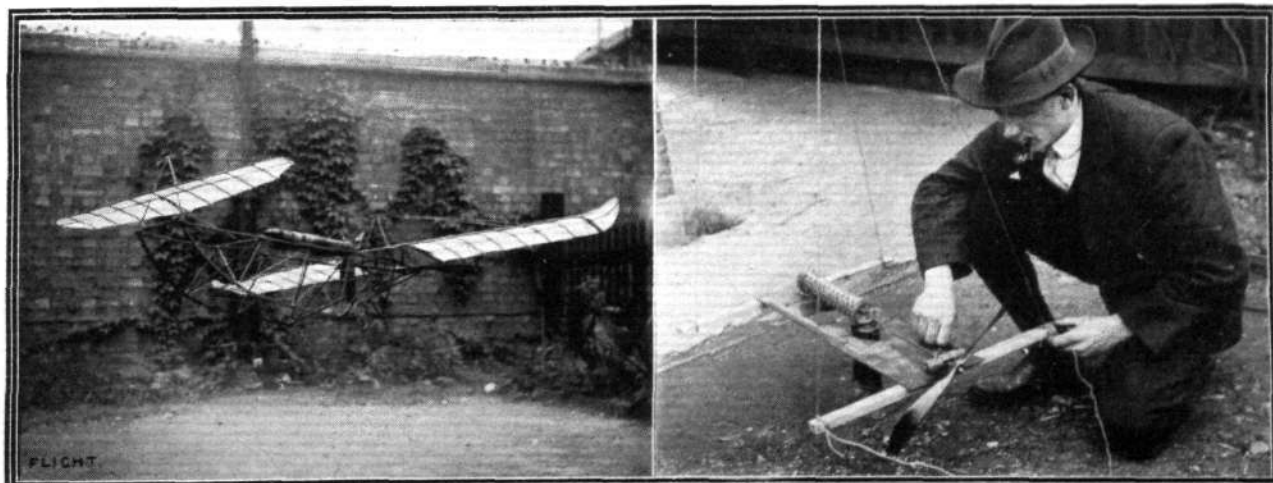
Mr. G. Haddon Wood (Hon. Sec. Birmingham Aero Club),

writes as follows: "With reference to your remarks *re* inter-club contests, this club is very much in favour with what you say on the subject. Mr. Wood thinks that the contests and the giving of points might be well arranged as in cricket fixtures, the scores being in seconds instead of runs. Each club to have a team, say of six [we are afraid this is too many—should say four as an outside limit if the journey was a long one]. When competing, the total times of each



individual of each team to be added and the team with the biggest totals to be the winners. By obtaining a list of all the clubs wishing to compete and drawing up a set of rules for the teams, a table showing the position of the teams could be drawn up and published each week. The table would probably have to be arranged on the percentage of points, as the number of contests would no doubt not be the same with each club. Already this club is arranging a visit with the Coventry Aeroplane Building Society next Easter, and if they are organised properly can be made much more interesting.

Mr. W. E. Evans (Hon. Sec. Paddington and District Aero Club) says: "I am making these contests a feature of our club programme



On the left Mr. H. H. Groves' steam-driven model referred to in February 10th issue. This model has actually flown. On the right Mr. H. H. Groves and his steam plant for models, constructed for Mr. V. E. Johnson.

this year, and I see no reason why they should not be a success or be popular with the various London clubs. As regards provincial clubs—the chief difficulty is the travelling expenses—and also the time. I doubt whether the majority of clubs would grant members' expenses, and if not would the members be willing to pay their own? Perhaps an intermediate policy could be adopted by clubs and their members, each paying half. Contests might be arranged between London and provincial clubs when cheap trips are available—but I doubt whether a tournament between all the clubs is possible at the present moment. There are at least six clubs in and around London, why not start a London League of Aeromodellists, embracing these clubs only. Some generously disposed person might then be persuaded to offer a cup for the winning club. Mr. J. W. Burghope (Assist. Hon. Sec. Brighton and District Aero Model Club) thinks the idea is certainly excellent but is afraid the putting it into practice would be very difficult [good things generally are]. The chief objection is of course expenses, very few of the average club members in the provinces could afford to run up to London for a day. [What, not even from Brighton for half a day?] And again, models are not generally improved during a more or less lengthy train journey [this is news to us]. On the first score alone—expenses—I am afraid the idea will prove impossible to work."

Mr. Malcolm B. Ross (Hon. Sec. Northern Branch Aero Models Assoc.) again thinks the idea is excellent, but that it could (so far as the London and provincial clubs are concerned) be followed only by a few of the clubs—at present existing in London—the one reason being that the club funds would not permit of it. [We do not see the necessity of regarding it from this point of view.] But let those clubs who are in a good way carry it out by all means; and in the meantime why not inter-club contests between the home [London] clubs?

A challenge from the Ealing and District Ae.C. has been received and accepted. If more of this could be arranged why not let FLIGHT be the medium? Let the various clubs issue challenges (to be inserted in FLIGHT), then those wishing to meet the challengers have only to apply to the club secretaries for further particulars.

[The one thing necessary for success is that they should be properly organised, and not arranged haphazard fashion, and that they should be held under a common and uniform set of rules.]

Steam-Plant Tests.

The following are a few particulars about the steam plant just completed for us as an especial favour by Mr. H. H. Groves, of Westcombe Park (see illustration):—Weight of engine, 3½ ozs.; of plant, excluding propeller, fuel, &c., 1 lb. 7 ozs.; of complete plant,

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THE KITE AND MODEL AEROPLANE ASSOCIATION. OFFICIAL NOTICES.

Registration of Model Aeroplane Performances.—All applications for the next trials at Parkside, Sudbury, on the Paddington and District Aero Club ground on April 13th, must be received by the hon. sec. not later than April 2nd on forms which can be had on application.

The Royal Aero Club's Competition.—The rules submitted to the R.A.C. for a Hydro-Aeroplane competition for models weighing not less than ½ lb., rising off and alighting on the water,

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PROGRESS OF FLIGHT ABOUT THE COUNTRY.

NOTE.—Addresses, temporary or permanent, follow in each case the names of the clubs, where communications of our readers can be addressed direct to the Secretary. We would ask Club Secretaries in future to see that the notes regarding their Clubs reach the Editor of FLIGHT, 44, St. Martin's Lane, London, W.C., by first post Tuesday at latest.

MODEL CLUBS.

Aero-Models Assoc. (N. Branch) (Sec., MALCOLM B. ROSS 15, HIGHGATE AVENUE, N.).

The open distance event for the Mann set of parts took place on Saturday last. Result—1st, A. Houlberg, 1,442 ft. As Mr. Houlberg had previously carried off the honours on three occasions, he generously passed his prize over to R. L. Rogers, who came in second with 1,341 ft. Total distance of A. Houlberg's winning flight was estimated at 650 yards, and during that time attained heights of 160 ft. Other measured flights were: A. Houlberg, 1,226 ft.; R. L. Rogers, 1,003 ft., 1,248 ft.; A. O. Rogers, 1,290 ft.; H. E. Fletcher, 1,128 ft.; H. D. Murray, 1,054 ft. Mr. Fletcher's model on nine successive flights did absolutely straight of approx. 1,000 ft. H. Lingard and A. D. Trollope, from Palmer's Green, both did good flights, Trollope's machine surprising everyone by rising to at least 180 ft. E. R. Brown and R. G. Corder were both flying well. Others present with flying models, G. O. Partridge,

including 4 ozs. of water, 1½ ozs. of benzoline, and ¼ oz. lubricating oil, and propeller and fixing brackets, 1 lb. 14½ ozs.

Best results (using one of Bonn's 16-in. diameter Chauvière propellers, illustrated March 16th issue), 3 mins. run; for 2 mins. the thrust was from 14 ozs. to 17 ozs., 1 min. being wasted in adjustments, &c.

In another test, a thrust of 1½ lbs. was obtained for 1 min., 1½ lbs. for 1½ mins., the thrust falling off but little, remaining at 12 ozs. practically until the end.

In another test, 20 secs. was spent in getting up to a thrust of 1 lb. The thrust then remained practically constant (not varying by more than an ounce the whole time) for 1 min. 20 secs. at 1 lb.

An additional pressure of one-half in the benzoline reservoir had the effect of sending the thrust up something like half a pound and caused the tiny engine to make the propeller fairly hum in the air. The tests were only just of a preliminary rough-and-ready character, but they certainly considerably surpassed the most sanguine expectations, and we feel that we are deeply indebted to Mr. Groves. The building of the aeroplane to carry the plant and the finding of a suitable day and ground for preliminary trials in actual free flight may take anything from six weeks to three months, as we have only a strictly limited amount of time to devote to the matter.

Supposing that one chose to run the plant for all it was worth, there was every indication of its proving itself a successful helicopter, but no such end as that is in view.

It will be seen, on referring to the illustration, that the generator is of the flash-boiler type, with water and benzoline reservoirs vertical, and lamp and boiler (both pressure fed) horizontal; engine, horizontally opposed type; two single-acting cylinders.

Queries.

F. WIEDMANN, Jun.—Intends to build a petrol-engined monoplane of 8 ft. span, and desires the following information: What h.p. should the motor be? What diameter propeller? And what material should be used, and what should be the length of the machine?

H. JONES.—Desires to know particulars as to wood required, &c., for making a small model of the Short monoplane recently illustrated in FLIGHT.

Replies in Brief.

W. M. BLOOMENFIELD.—Its action would be very greatly diminished, even if not absolutely annulled. No, we do not. Personally we think it was due to a defect in the machine, but it will probably never be known.

have met with their approval. Therefore members should now get to work and experiment with such models and attempt to lift the prizes, which are £5 5s., £3, and £1.

Kite Corps (Foot Section).—The members of this corps will meet at the Plumes Hotel, Park Royal, to-day, Saturday, at 2.30, for instruction under command of Major B. Baden-Powell. Any other members interested are invited to attend.

W. H. AKEHURST, Hon. Sec.

O. W. Root, A. P. Hawgood, and S. Hindsley. All above figures were measured by Messrs. Pidsley and Wentker.

Inter-club match on April 6th, at Finchley, with Palmer's Green Ae.C., and later at Ealing with the Ealing and District Ae.C. Flying to-day, Saturday, at Finchley.

Birmingham Aero Club (Secs., R. COBHAM, G. H. WOOD, 8, FREDERICK ROAD, EDGBASTON).

MEMBERS are now preparing their models for their visit to the Coventry Aeroplane Building Society, including several new models. Last week Mr. G. Wilde made an attempt on the club model gliding record, and beat the old record handsomely with a glide of 65 yards down the gliding hill. Last week-end was very unsuitable for model flying, but Mr. Trykle managed to obtain 78 secs. Much excitement was caused by a person in scout uniform firing with a carbine across the aerodrome, one of the bullets going through a farm door a mile away. The culprit was caught and handed over to the police after an exciting four-mile chase.

Next monthly meeting at Bell Inn, Phillips Street, Monday,

April 1st, 8 p.m. Club business, lectures and discussions take place at these meetings, and a hearty invitation is extended to non-members to attend.

Blackheath Aero Club (Hon. Sec., A. E. WOOLLARD, 48, HAFTON ROAD, CATFORD, S.E.).

At Kidbrooke last week-end Mr. Brown was flying his new "Fearless" biplane, Mr. A. B. Clark the 2½ and 5-oz. Victor machines. The 5-oz. model, is an "A-frame" machine. Mr. Bailey obtained some excellent straight flights with his Antoinette model, Mr. Plummer had three models, Messrs. Woollard, Holland and Morris were flying single stick models, whilst Peter, Hoch, Jarvis and Holland made good flights with "A-frame" models.

At Lee the weather conditions unfavourable. The only flights of any importance were made by Mr. Bailey's model, Mr. Brown was also flying a tractor machine.

At Blackheath Mr. Dollittle had the misfortune to smash his model after having obtained some good flights.

At Crofton Park Mr. A. B. Clark was flying a new biplane, its stability was excellent.

At Clapham Common Mr. Williams was indulging in high flying, his machine flew off the Common and was regained in a side street nearly 700 yds. from the starting point. Mr. Slatter was flying a monoplane specially constructed for duration.

Next week-end flying will take place at Kidbrooke, Lee, Blackheath, Grove Park and Crofton Park.

Brighton and District Model Aero Club (Hon. Sec. A. VON WICHMANN, "KINGSLEIGH," KINGSWAY, HOVE.)

GOOD work at Shoreham on 16th. Members are reminded that Mr. Townsend's prizes are open for competition till end of Easter school vacations. Flying at Shoreham to-day (Saturday).

Bristol Model Flying (Sec., R. V. TIVY, 3, ROYAL YORK CRESCENT, CLIFTON).

A MEETING will be held at the Sea Walls to-day (Saturday), at 3 p.m.

Cardiff Aero Club (114, MISKIN STREET, CATHAYS).

AN exhibition is to be held with the Cardiff Model Engineers' Society on Wednesday, April 17th, to commence at 3 o'clock, to be followed in the evening by a whist drive at the White Hall Rooms, Park Hotel. Successful model-making work is going on at the workshop, as each member is making a model for the above exhibition. Tickets from the secretary. Whist drive, 2s. 6d. (which will also admit to exhibition); exhibition tickets, 6d., to be obtained at the door.

Croydon and District Aero Club (158, HIGH STREET).

INCLEMENT weather on Saturday, but 11 machines were out. Best flight of the afternoon by Mr. P. Hart, distance 1,104 ft., and duration 40 secs., measured and timed by Mr. C. Parkes. Mr. D. Pavely, one of our most scientific model makers, brought out a new tractor monoplane of distinctive design, which rose from turf and flew well. Messrs. C. Smither and W. Bell also had numerous good flights.

A club competition has been arranged for Good Friday, when several prizes will be given.

Dover and District Model Aero Club (Sec., H. D. DAVIS, "OAKVILLE," GODWYNE ROAD, DOVER).

ON Saturday, owing to the strong wind, the competitions were postponed. There will be a meeting of the officials and members of the club on Saturday evening.

Ealing and District Aero Club (Sec., B. J. KIRCHNER, 1, QUEEN'S GARDENS, EALING, W.)

MESSRS. L. ROCHE, C. Chilcott, S. H. Bostock, C. Roche, L. Kirchner, G. Beeching, G. Condon, M. Reed, J. Pratt, B. J. Kirchner and D. A. Butler brought models on Saturday for the eliminating trials for contest with Paddington Aero Club. Owing to the wind and rain, no very conclusive results reached. L. Roche made 15 flights of over 25 secs. duration; his best durations were of 40, 41, 44 and 40 secs. C. Chilcott obtained good durations of over 25 secs., best being 31 secs. L. Kirchner, with his rookwing-planes model, obtained two durations of 25 secs. B. J. Kirchner on one occasion got to 450 ft.

On Sunday, Mr. C. Davies was flying his 0-1-1-2P model; L. Kirchner was again testing his new model. A noticeable feature with almost all the models of members of this club is their good construction, a point which ought to be encouraged in competitions. The following new members were enrolled:—Messrs. A. Haulberg and Margetson and Master W. Aukatell, the youngest member, aged 10.

Saturday, meeting at usual place. Certificate rules will most likely be out next week.

Will Mr. L. Cousens, of Shepherd's Bush, please communicate with the Secretary.

Hackney and District Aero Club (Sec., B. H. LONGSTAFFE, 47, JENNER ROAD, STOKE NEWINGTON, N.)

ON Saturday P. Gittus won competition for steering and stability. Good work by Marmin, Hill, and P. Hurlin. A duration model has been offered by P. Gittus for first novice to fly quarter mile with own model. L.C.C. rules for model flying on Mill Fields:—Models restricted to under 4 lbs. in weight. No flying after 10 a.m.

Higher Broughton Model Soc. (1, ESKRIGGE ST., MANCHESTER).

GENERAL meeting to-day (Saturday) at 7 p.m. sharp, when a short paper will be read.

Manchester Model Ae.C. (40, BIGNOR STREET, CHEETHAM).

OPENING flying meeting at the aerodrome, Trafford Park, on Saturday, April 20th, at 2.30 p.m. A competition will be held and cash prizes will be offered. The competition will be decided upon by the following formula:—

Total weight in ozs. × distance flown in ft.
Weight of rubber used
The machines must not weigh more than 4 ozs. They must be home made, including the propellers.

Paddington and Districts Aero Club (Sec., W. EVANS, 133, BUCHANAN GARDENS, HARLESDEN).

AT duration trials at Parkside, Sudbury, last Saturday, although windy, several good flights were obtained, viz.: Chalfont, 45 secs.; Hurlin, 44 secs.; Weston, 43 secs.; Woolley, 30 secs.; Carter, Lane, Davidson, Holden and Jackson did from 20 to 30 secs.; C. Levy, M. Levy and Evans also flying.

Duration contest to-day (Saturday) with Ealing and Districts Club, at 4 p.m. prompt. Times in this competition will also be counted for the club certificates, a framed one of which may be seen at the workshops. A frame and mount complete will be given to the first member to gain a first-class certificate, and another to the first novice to gain a second-class certificate.

An inter-club contest is being arranged with the Birmingham Aero Club.

Reigate, Redhill and District Aero Club (Sec., H. V. MAY, 4, LONDON ROAD, REIGATE).

MESSRS. LEWIS and Norton were out on Monday last with Lewis' 6-ft. glider, and succeeded in obtaining glides of nearly a mile from Reigate hills. On Wednesday, Messrs. Osborne, Cox, Norton, and Lewis were out with machines. Mr. Cox got several flights of over 200 yards. On Saturday, Messrs. May and Sutton succeeded in taking their 3rd-class certificates, in spite of very gusty winds. Mr. Lewis had out stream-line wing "Almono," testing propellers.

Meeting Saturday (to-day) at the Earlswood ground.

St. Mary's Model Aero Club (Sec., H. W. A. JOHNSON, THE VICARAGE, KINGSTON, PORTSMOUTH).

WEATHER very inclement and ground like a marsh on Saturday. Messrs. Johnson and C. Restall were testing a new monoplane built by Mr. V. L. Addison, of Shanklin, Isle of Wight, and called the "V.L.A. Torpedo" machine, which is a single screw, proved to be a very fast, very high and stable flier. Messrs. Eburne, Webb and Haswell made good flights. Messrs. Harper and Byerley in fine form with a "Bur" each. Mr. Robbins flying own design well.

Salisbury Model Aero Club (Sec., E. M. LEAR, VICTORIA COFFEE ROOMS, BUTCHER ROW).

COMPETITION, Easter Monday, at Wilton Road flying ground, organised by Messrs. Dixon and Co., of this city, under the patronage of the Wiltshire Arts and Crafts Association. A 10s. 6d. twin-screw flyer (first prize), and a Clark's 1-oz. model, value 3s. (second prize), are offered as prizes for a model of any type, under 4 oz. in weight, giving the longest flight. There are also two classes for model flying machines in the exhibition held on April 9th and 10th, to be opened on the first day by the Countess of Radnor, and on the second day by the Mayor of Salisbury. Those representing the Salisbury Aero Club will be G. J. Robinson, H. Sperring, W. F. Street, O. F. Noyes, and E. M. Lear.

The Secretary would very much like to get into communication with anyone interested in model aviation in this district.

Scottish Ae.S. Model Aero Club (6, McLELLAN STREET, GOVAN).

THE monthly competition was held at Barrhead aerodrome last Saturday in very stormy weather. Results:—Mr. J. C. Balden, 1,629 ft., 37½ secs.; Mr. Wm. Langlands, 1,144 ft., 26½ secs. Distance and duration are separate flights. Messrs. Graham, Boyd and Gordon were making experimental flights. Mr. Langland's model caused great amusement by diving into the burn on one occasion with 800-turns power behind it. Next Saturday, the 30th March, a meeting for hydro-aeroplanes will be held at the pond in Queen's Park. Pollokshaws cars pass the gates.

A brilliant programme is being prepared for the summer season

which will include nearly all branches of model aero work. It is hoped also to arrange a match between the hydro-aeroplanes and the local model speed boat club. The club has now entered the second half of the year and intending members can be enrolled at a fee of 4s., which includes membership until the end of the financial year in September. Members will continue to meet in the Institute, Elmbank Crescent, on Friday evenings, for discussions, &c. The reading-room and library are open on the other evenings of the week when the brainy members can peruse the volumes of Lanchester, Maxim and others in peace and quietness. Some fine books on models have just been added, and the committee desire that the members take full advantage of the benefits provided for them.

Sheffield Model Aero Club (Hon. Sec. C. F. W. CUDWORTH, 35, PENRHYN ROAD, SHEFFIELD).

A GENERAL meeting was held on March 14th at Broomhead's Dining Rooms, Leopold Street. The chair was taken by Mr. A. V. Kavanagh, who gave some interesting speeches on Aeronautics. He urged the members to bring out original ideas for the aeroplane. The detail drawings, designed by Mr. T. Pashley, were distributed to those present. Mr. W. R. Blake was appointed hon. president, through the resignation of Mr. M. D. Manton, of Shrewsbury House, Park Sheffield, who has taken up practical aviation at Hendon Aerodrome (Grahame-White School). It was decided that a letter be sent to Mr. Manton, on behalf of the members, wishing him every success on his new departure, and he was elected a hon. life member of the club. Six new members were enrolled. A vote of thanks was passed to Mr. Kavanagh for presiding over the meeting, and the gift of two clockwork models.

A THEORETICAL POWER CHART.

MR. MERVYN O'GORMAN's article in FLIGHT of January 13th will have been read with considerable interest by many, particularly by those whose deeper interest in the science is necessarily limited to its theoretical aspects. Not everyone who is a serious student of aeronautics is able to take up the practice of flying, or is even in a position to follow, at first hand, the art as practised by others. To these we have endeavoured to impart some little interest beyond mere curiosity by encouraging, as far as may be, an appreciation of simple theoretical principles so far as it seems logical to preach them.

Theory, however, loses its virtue when it fails to have any interest to the practical man, and the object of the theoretical mind should always be to find a link between its line of thought and that followed by whosoever is engaged on the practical work. Mr. Mervyn O'Gorman's article was mainly based on the utility of a chart devised and employed at the Government Aircraft Factory, which he superintends, and it will naturally have been the desire of those who studied this chart to link it up with their own lines of thought. And, as many readers of FLIGHT have probably adopted the rudimentary theory that has been consistently enunciated in these columns, and has since found a somewhat more complete expression in the recent publication of "Principles of Flight," we purpose showing one of these links by the aid of the accompanying diagram.

At a glance, it can be seen that this diagram has characteristics in common with the Aircraft Factory chart, but in this instance it has been built up step by step from theory, based on hypotheses with which our readers are by now thoroughly familiar.

The object of this chart is to show the theoretical power required to maintain an aeroplane in flight. This power is expended on overcoming two resistances, which, as was, we believe, first pointed out by Lanchester, should be kept entirely distinct. One resistance is the resistance of the wings that support the load; the other is the resistance of the body and superstructure necessary to complete construction of a practical aeroplane.

For the sake of convenience the chart has been plotted in units of 1 sq. ft. and in the case of the wings the arbitrary loading of 3 lb. per sq. ft. has also been used as a basis of calculation. The resistance of 1 sq. ft. of wing surface lifting 3 lb. at varying speeds of flight from 40 to 80 m.p.h. is ascertainable from the diagrams on pages 71 and 72 of "Principles of Flight," where the theoretical basis of the calculations is explained in detail. The resultant curve is shown on the chart herewith, and it will be noticed that the resistance rapidly decreases as the speed increases, particularly between the speeds of 40 and 60 m.p.h. This increase of speed, however, is accompanied by an increase in the body resistance, the graph for which on the accompanying chart is taken from the corresponding diagram on page 87 of "Principles of Flight."

By adding the body resistance to the wing resistance a new graph is obtained, representing the wing + body resistance, which it will be observed ceases to decrease with the increase in speed after a velocity of about 72 m.p.h. has been obtained.

This particular critical speed is, of course, a purely arbitrary value

It has been decided to hold another meeting on March 28th at Broomhead's, 7.30 p.m., to decide on field and prizes for the forthcoming competition to be held on Easter Monday.

Stony Stratford and District Kite and Model Aero Club (Hon. Sec., O. HAMILTON, JUN., OLD STRATFORD).

AT general meeting on March 14th, at the club-room, the secretary read a letter received from Mr. R. W. Field, resigning the chairmanship, and a vote of thanks was accorded him for his services to the club. Mr. C. L. Matson was elected to fill the vacancy. The secretary then read the paragraph upon Inter-Club Contests from FLIGHT, of March 9th, and after a discussion it was decided that while approving of such a scheme the members did not think they were at present in a position to consider the scheme, but the secretary was informed to keep the matter open. Mr. O. Hamilton, Jun., read his paper, "Observation," in which references were made to the valuable information collected by Dr. Hankin. References were also made to the letter appearing in FLIGHT, March 2nd, from Mr. Roche, on "Sunshine and the Duration of Flights." The chairman in summing up emphasised the value of a log-book of flights, and the conditions under which they were attained.

Worcester Model Aero Club (Sec., S. A. SEARS, VICTORIA INSTITUTE, WORCESTER).

THE third monthly competition took place on the 16th, both single- and two-propeller models competing. Best flight by Mr. P. Colton's single-propeller model, weighing 1 $\frac{3}{4}$ ozs., and being driven by only $\frac{1}{4}$ oz. rubber. The power is only one-seventh of the total weight, which speaks well for the efficiency of the model.

Meeting to-day, Saturday, on Pitchcroft, at 3 o'clock.

determined by the relationship of body area to wing area, which in this case is assumed to be equal. It is difficult in actual practice to

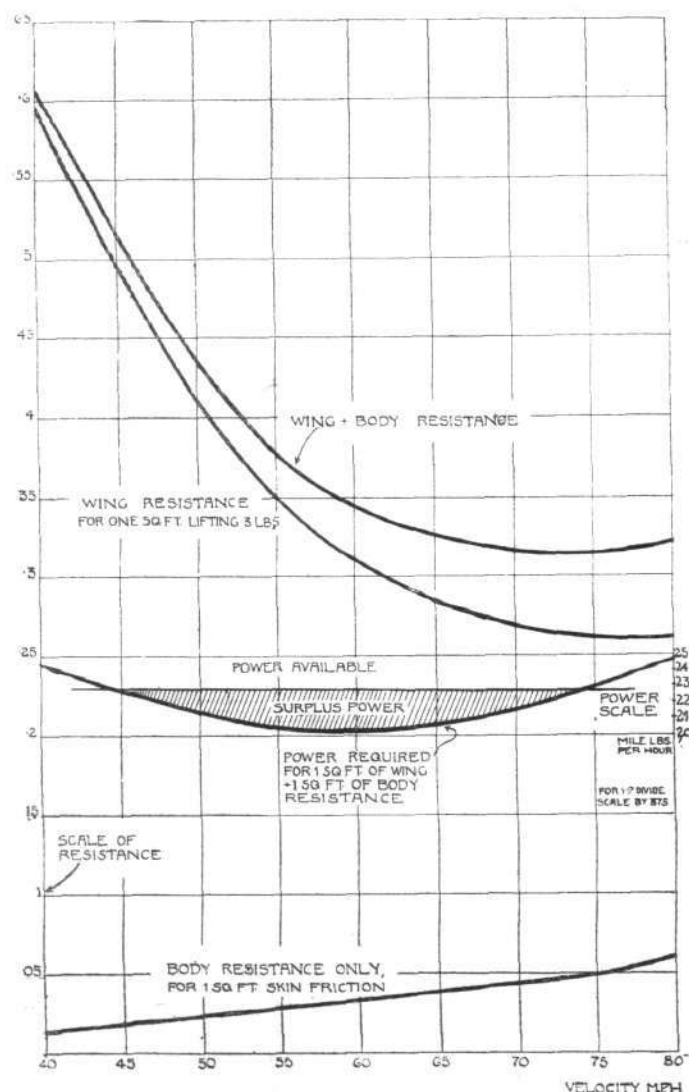


Chart based on elementary aeroplane theory for comparison with the Army Aircraft Factory chart published in Mr. Mervyn O'Gorman's article in FLIGHT, January 13th.

assess these relative values with any degree of accuracy, more particularly as the law of skin friction on which the body resistance is calculated only applies to surfaces of short chord. In the case of a covered in monoplane fuselage, for example, which is perhaps 20 ft. in length overall, there may very well be as much as 150 sq. ft. of external surface. It is, of course, impossible to say what is the effective value for this, because although the great length of the surface in the line of flight modifies the law of resistance so as to reduce the magnitude of the resultant, nevertheless there are other obstructions that properly come within the field of body resistance, which have not been included in this calculation. For the mere purposes of theoretical argument, however, it is not without reason to assume something in the order of equality between the effective body resistance area and the effective wing area; monoplanes at any rate are quite frequently built with wings of less than 190 sq. ft. area.

This particular problem, however, is of less importance than an appreciation of the effect of the relationship between body resistance and wing resistance such as can be obtained by a study of the chart. If, for example, the effective body resistance area can be reduced so as to lower the graph of body resistance in the chart, then the critical speed at which the total resistance ceases to diminish will be raised above the point indicated in the diagram. Alternatively, if the effective body resistance is increased, then the total resistance will begin to increase with increasing speed at a considerably lower velocity than is indicated in the present example.

It must be understood in any case, of course, that the decrease of wing resistance alone with increasing speed is entirely dependent upon the wing having a proper camber to suit each particular speed, the camber being a measure of the angle of deflection, which is assumed to represent the effective angle of the wing. It is, however, unnecessary to dwell upon these points of theory in this article as they have already been elaborated in former articles and can be more conveniently referred to in "Principles of Flight."

The next point in the synthesis is to convert resistance into theoretical power required by multiplying each resistance by speed. Thus, when the graph of wing + body resistance is multiplied at each point by the velocity as indicated on the scale, there results the power graph, which for convenience has been drawn in the middle of the chart to an independent scale. This curve of power required has, it will be observed, a very different characteristic to the curve of resistance. The most important point to notice is that there is only a comparatively small decrease in the power required

with increasing velocities, and that the critical point beyond which the power required begins to increase, occurs at a much lower velocity than is the case with the graph of resistance. Thus, in this particular instance, the power required decreases from 40 to 60 m.p.h. and increases at about the same rate as it previously decreased from that speed upwards. Once again the reason for this theoretical decrease in power with increase in speed is due to the superior "efficiency," or reduced co-efficient of flight, obtained from the wing angle at higher velocities. This advantage outweighs the body resistance until the critical speed is reached, when the increasing body resistance outweighs the advantage of the improved wing angle.

Now this theoretical power curve is also based on the assumption that the wing changes in camber to suit the velocity, and as there are no variable camber wings in practical use at the present time it might be supposed that this curve had no bearing upon actual fact. It has for some while been recognised, however, that aeroplanes capable of flying at all well have an appreciable range of speed instead of being only able to fly at one particular speed, as was once supposed to be the case. At the same time, however, it is also recognised that the attitude of the machine as a whole, that is to say its angle of incidence to the line of flight, also changes between one extreme speed and the other and this change of attitude is virtually equivalent to a change of camber inasmuch as it certainly changes the effective angle of the planes, although not necessarily so efficiently as varying the camber would do.

If, for the sake of example, we suppose that flying at a low speed is wasteful of power, the machine being or *cabré* tilted up, then there may be a fairly rapid gain in economy, as the machine flies faster and is thereby enabled to assume a better wing attitude. Flying faster still, however, the head resistance of the body and superstructure begins to be felt, and there comes a speed beyond which the aeroplane cannot attain with the engine power actually available.

Superimposing a curve of power available on the graph of power required, produces a range of speeds between which there is a certain amount of surplus power available for climbing. In the chart herewith, the graph of power available is drawn as a horizontal straight line, but in practice this is not the case for the reason that actual revolutions and propeller efficiency modify its simplicity. It is a point on which particular interest attaches to a comparison between this diagram and the Aircraft Factory chart, but having thus introduced the subject we leave it to our readers to digest the mental food that they should find therein.

✱ ✱ ✱ ✱

CORRESPONDENCE

. The name and address of the writer (not necessarily for publication) MUST in all cases accompany letters intended for insertion, or containing queries.

Correspondents communicating with regard to letters which have appeared in FLIGHT, would much facilitate ready reference by quoting the number of each letter.

Combined Wheels and Skids.

[1514] In your abstract from Mr. de Havilland's paper on aeroplane undercarriages, it is mentioned that Farman was the first to combine wheels with skids. This is not correct, because Mr. A. V. Roe covered this in his 1906 patent, and it was introduced in his first biplane, which, incidentally, was the first power-driven machine to get off the ground in this country.

I have been looking up the Patent Records, and find that the above patent appears to be the first taken out in connection with present-day power-driven aeroplanes.

I hope you will give this correction due notice in your paper.
H. V. ROE.

Engine-in-Front Question.

[1515] In your publication I have noticed several references to Mr. A. V. Roe as the originator of the popular engine-in-front fuselage biplane-type O-P-2-1. As I am not in a position to contradict these statements, I will merely say that in the summer of 1909 a Goupy biplane of this type was constructed in France. The machine in question consisted of either a genuine or else a very close copy of a Blériot fuselage, surmounted by a staggered biplane cellule on its forward end, and a small staggered biplane tail at its other extremity; it was fitted with Blériot landing gear.

At this time Mr. Roe may have already constructed such a machine, and if so I must apologise for wasting so much of your valuable space.

N. York.
J. G. GILPATRICK.

Military Airships.

[1516] With reference to Lieut. C. M. Waterlow's excellently thought out and interesting paper on the above subject, as you ask for comments I should like to make a few.

Presuming airships to have any utility, the mooring problem is necessarily the most important point of any. If my memory serves, it was in 1909 that considerable attention was devoted in America (theoretically only) to the mooring on a mast system. The whole idea of sheds appears to be fallacious—submarines remain on their element and are not hauled into sheds on the beach. A submarine floating at rest is very analagous to an airship moored a short height above the ground. The one operates downward in the water, the other upwards in the air, but it is the same thing in general principle. This raised the question of natural airship harbours, of which we heard a good deal more some years ago than we do to-day.

I have in mind such a "harbour" that I know of at the present moment, three sides sheltered by high ground, the fourth open yet screened by distant hills, in such fashion that a dirigible would emerge in favourable conditions always. There must be many such natural harbours in the country. The location and survey of them might prove very useful in war time, and allow of mooring in circumstances where the portable mast, &c., might be unavailable. Much seems to turn on the production of the ideal equivalent of the anchor of a ship.

In the matter of action between a dirigible and an aeroplane, I cannot help thinking that the author of the paper takes too optimistic a view of the airship's chances. He contemplates a duel only; whereas surely aeroplanes will invariably act in groups. Then to avoid one, would probably be to foul another. Till dirigibles can utilise some yet-to-be-discovered non-flammable gas, and be divided into very numerous compartments, they seem at an infinitely greater disadvantage against aeroplanes than the big ship of the sea against torpedo attack. There are many who query whether the big ship will survive the next naval war, though equipped with torpedo nets, internal anti-torpedo defence, and small cruisers, &c., to keep off attacking torpedo craft. It is generally held that these last alone will ensure her safety; practically no one afloat believes in the anti-torpedo gun as an effective weapon.

Surely then, if we are to obtain any war advantage from the special features of the far more vulnerable dirigible, we will be

compelled to defend it with aeroplanes. This seems a point of supreme importance; and the only practical way of carrying out the author's axiom that "aeroplanes and airships" are the ideal.

As regards swivelling propellers, the U.S. "Rekar," which was going "to manufacture its own gas in flight," had four such. This wonderful craft, however, has failed to materialise, so the Gamma design is unique in this feature.

As regards observation of gunfire, I have it on very good authority that the Japanese used a kite-balloon (the "Yamada" of those days) for indirect fire at the Russian ships inside Port Arthur. They did not obtain any great accuracy with this—nothing comparable to what they secured after establishing an observation station on 203 Metre Hill. This seems independent proof of one part of the author's paper which is likely to be contested.

With reference to the proposed look-out station on top of the envelope, that would presumably later on result in a demand for a gun there. This, if found feasible, would mean a portion of the armament incapable of firing down, a portion incapable of firing up. I seem to recollect a proposal in Germany for fitting a Zeppelin with one gun on the nose and one on the tail. It was purely visionary when made, of course, but may be worth keeping in mind. For purely look-out purposes on top some form of periscope might be evolved.

Other points occur, but for the present these may suffice. A few years since we realised that if we were to hold the sea, we must be able to hold under it also. Now we have over it to consider. Beside that question everything else aerial is trivial. So far we have done no better than regard aircraft as sky motor cars. There is far more in them than that. The sooner we realise that, the better.

FRED T. JANE.

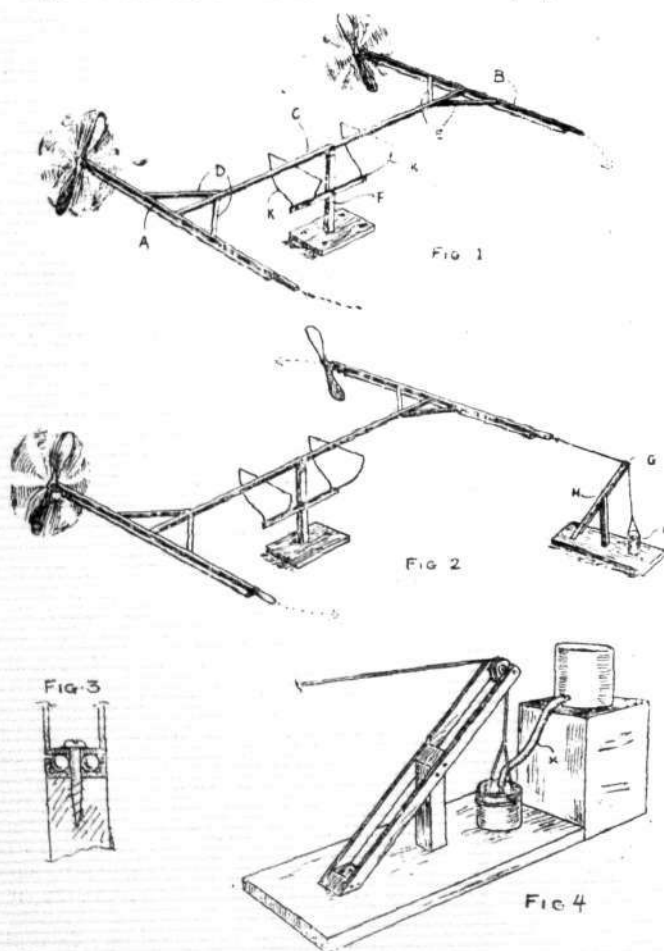
MODELS.

A Simple Propeller-Testing Apparatus.

[1517] The following is a description of a simple apparatus which can be made by any amateur in a very short time, and which answers two purposes. (1) To find the relative thrust of a pair of propellers, and (2) the exact thrust of any single propeller.

Referring to Fig. 1 the framework consists of two elastic motors A and B (attached to which are the propellers to be tested) connected together at their middle by a cross-beam C, and braced by struts, D and E. The cross-beam is pivoted at its centre on a support F.

Fig. 1 shows the two motors fitted with two propellers to be



tested. Both must be wound up to an equal amount and then let go instantaneously. If the apparatus revolves in either direction it shows that the thrust of one propeller is overcoming that of the other, according to the direction of rotation. The propeller blades should, therefore, be steamed round to a greater or less pitch so as to adjust them until the apparatus remains stationary during the test.

Fig. 2 represents the apparatus for testing the exact thrust of a single propeller. Suppose the propeller of the motor, A, is to be tested; to the end of the motor, B, attach a cord running over a pulley, G, and connected to a container, I. The motor, A, is then wound up, and the amount of thrust is registered by the weight lifted in the container.

If a tractor is to be tested, the cord and weighing apparatus must be attached to the end of the motor, A. Fig. 3 illustrates the ball-bearing pivot for the cross-beam, C, which is allowed to work vertically, as well as rotate through a small arc horizontally.

Fig. 4 illustrates the weighing attachment, and shows the construction quite clearly. X is a rubber tube supplying sand to the container from the reservoir, the supply being regulated by pinching the tube.

Salisbury.

S. J. ROBINSON.

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